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[New Hampshire Code of Administrative Rules](#)
[Env-Ws 700](#)

NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES

CHAPTER Env-Ws 700 STANDARDS OF DESIGN AND CONSTRUCTION FOR SEWERAGE AND WASTEWATER TREATMENT FACILITIES

Statutory Authority: RSA 485-A:6, III

PART Env-Ws 701 PURPOSE, WAIVERS, AND DEFINITIONS

Env-Ws 701.01 Purpose. The purpose of these rules is to protect public health and the water environment by establishing minimum technical standards and requirements for the design, construction and award of contracts for sewerage and wastewater treatment facilities.

Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 701.02 Waivers.

(a) The rules contained in Env-Ws 700 shall apply to a variety of conditions and circumstances, and strict compliance with all rules might not fit every situation. The owner of proposed sewerage or wastewater treatment facilities, or the owner's authorized representative, may seek waiver relief from specific rules contained in Env-Ws 700 in accordance with (b) below.

(b) All requests for waivers shall be submitted to the department in writing and provide the following:

- (1) A reference to the specific rule for which a waiver is requested;
- (2) An explanation of why the waiver is necessary, including demonstration of hardship caused by rule compliance;
- (3) A proposed alternative method, procedure or design, with supporting data and calculations; and
- (4) Written concurrence of the municipality.

(c) The department shall grant waiver relief upon finding that the proposed alternative is at least equivalent to the specific requirements contained in the rule, is adequate to ensure that the provisions of RSA 485-A are met, and protects human health and the environment.

Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

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New. #6590, eff 9-26-97

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Env-Ws 701.03 Definitions. The following definitions shall apply to this chapter:

- (a) "Biochemical oxygen demand (BOD)" means the amount of oxygen utilized by microorganisms in the biochemical oxidation of decomposable organic matter under aerobic conditions, as expressed in milligrams per liter.
- (b) "Commissioner" means the commissioner of the New Hampshire department of environmental services.
- (c) "Cross-country locations" means locations not otherwise defined as roadway locations.
- (d) "Department" means the New Hampshire department of environmental services.
- (e) "Engineer" means the engineer of the owner, acting individually or through duly authorized representatives.
- (f) "Gpm" means a unit of flow as measured in gallons per minute.
- (g) "H-20 loading" means the force imposed by a pair of 16,000 pound concentrated loads, one located over the point in question and the other located 72 inches distant, so as to simulate the tire loads of a truck.
- (h) "Mgd" means a unit of flow as measured in million gallons per day.
- (i) "Mg/l" means milligrams per liter.
- (j) "Municipality" means a city, town, district, county or other public body created under state law and having jurisdiction over treatment and disposal of wastewater.
- (k) "Owner" means the municipality or private owner for which sewerage or wastewater treatment facilities are designed or constructed.
- (l) "Roadway locations" means all parking lots, traveled ways and roadway shoulders.
- (m) "Sewage" means "sewage" as defined in RSA 485-A:2, X, namely, "the water-carried waste from buildings, public or private, together with such groundwater infiltration and surface water as may be present".
- (n) "Sewer appurtenances" means components of a sewer other than pipe, such as manholes, tees, wyes, chimneys, cleanouts, and siphons.
- (o) "Sewerage" means a system of pipes, pumping facilities and appurtenances for the collection and conveyance of sewage and liquid wastes.
- (p) "Standard scale" means the commonly used drafting scales of engineers and architects including, but not limited to, 1:10, 1:20, 1:40, 1:50, 1:100, and 1/8", 1/4", 1/2", 3/4" and 1" to the foot.
- (q) "Standard dimension ratio (SDR)" means the ratio of outside pipe diameter to pipe wall thickness, as used in the pipe manufacturing industry.
- (r) "Wastewater treatment facility" means an arrangement of devices and structures for treating wastewater and for dewatering and handling sludge materials removed from such wastewater. Such facilities do not include conventional septic tank and leach field systems as regulated under RSA 485-A:29.

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Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

PART Env-Ws 702 ENGINEERING DESIGN DOCUMENTS

Env-Ws 702.01 Design Drawings and Technical Specifications.

(a) Design drawings and technical specifications for proposed new or modified publicly or privately owned sewerage and wastewater treatment facilities shall be submitted to the department for approval in accordance with these rules.

(b) Design drawings and technical specifications shall be submitted for any proposed sewer which serves more than one building or which requires a manhole at the connection, and for any proposed pumping station which serves more than one building or has a capacity in excess of 50 gpm.

(c) Design drawings and technical specifications submitted to the department for review and approval action shall be prepared by, or under the direct supervision of, a New Hampshire-licensed professional engineer.

(d) All design drawings shall bear:

- (1) A title citing the project name, location and owner;
- (2) The scale;
- (3) The north point; and
- (4) The name and signature of the engineer, and the imprint of his/her registration seal.

(e) The design drawings shall be clear, legible and drawn to a standard scale which permits all necessary information to be plainly shown.

(f) The design drawings shall not be larger than 24 inches x 36 inches in dimension.

(g) A vertical datum shall be indicated and, if different from the national geodetic vertical datum of the United States Geological Survey, its relationship thereto shall be noted.

(h) The locations and logs of any test borings shall be shown on the plans or included in the specifications.

(i) The design drawings shall include plan views, elevations, sections and supplementary views which, together with the specifications and general layouts, provide the working information for the contract and construction of the works.

(j) Design drawings shall include:

- (1) The dimensions and relative elevations of structures;

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- (2) The locations and outlines of all mechanical equipment;
 - (3) The locations and sizes of all piping;
 - (4) Water levels; and
 - (5) Ground elevations.
- (k) Sets of design drawings and technical specifications required to be submitted shall be as follows:
- (1) For state or federally funded projects, 2 sets of preliminary plans and specifications for initial review and 3 sets of plans and specifications for final review; and
 - (2) For other projects, one set of preliminary plans and specifications for the initial review and 2 sets of plans and specifications for final review.
- (l) The following information shall be submitted by the engineer:
- (1) A general map showing the location of the project with respect to municipal boundaries;
 - (2) Detail plan and profile sheets of all proposed sewers and force mains;
 - (3) Details of construction of manholes, siphons, and other sewer appurtenances;
 - (4) General and detail plans for treatment plants and pumping stations;
 - (5) Technical specifications for all proposed construction; and
 - (6) Design calculations and parameters used for sizing the unit processes and components.

Source. #6590, eff 9-26-97

Env-Ws 702.02 Design Drawings for Sewers. Design drawings for proposed sewers shall, in addition to the requirements of Env-Ws 702.01, include the following:

- (a) The topography and elevation of existing or proposed streets;
- (b) The locations of all streams and water surfaces, including their direction of flow and high/low water surface elevations;
- (c) Contour lines;
- (d) The boundary lines of the municipality, sewer district or other area to be sewered;
- (e) The location, size, and direction of flow of all existing and proposed sanitary sewers;
- (f) A title block located in the lower right hand corner of the sheet to include:
 - (1) The title;

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- (2) The name of the owner;
- (3) The name of the consultant;
- (4) The date of the original issue and all revisions; and
- (5) The initials of the designer, draftsman, checker and responsible engineer;
- (g) Insets and detail sections with the scale shown directly beneath their subtitles;
- (h) Plan and profile views in which the plan view is placed at the top;
- (i) Plans shall show the title, date and scale, and shall show clearly show the location of:
 - (1) All existing structures affecting the project and all existing or proposed sewers;
 - (2) Treatment works;
 - (3) Existing and proposed sewer outlets or overflows;
 - (4) The north arrow; and
 - (5) The boundary lines;
- (j) The locations of existing, proposed and future sewers as differentiated by appropriate symbols or designations;
- (k) All topographical symbols and conventions used shall be as employed by the United States Geological Survey;
- (l) The horizontal distance or stationing between manholes, grades in feet per foot, and sewer sizes, types, and class shall be shown. Arrows shall be drawn to indicate the direction of flow;
- (m) All sewer appurtenances shall be depicted by symbols and referenced by a legend. Detail drawings of all sewer appurtenances shall accompany the detail sewer plans;
- (n) Profiles shall indicate:
 - (1) All manholes with manhole identification numbers;
 - (2) Existing and proposed water mains with elevations;
 - (3) Siphons;
 - (4) Pumping stations; and
 - (5) In the case of stream crossings, the elevations of stream beds, normal flow lines and the type of pipe;
- (o) The sizes and gradients of sewers, surface elevations, first floor house elevations, and sewer inverts shall

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be shown at or between each manhole;

(p) Profiles shall include borings and groundwater level and, except for special details, they shall be drawn to standard scales with a ratio of 10 horizontal to 1 vertical, which shall be indicated on each sheet;

(q) Finish grade elevations shall be shown. Elevations of manhole inverts shall be shown to the nearest 0.01 foot;

(r) All elevations shall be referenced to a standard datum, and the datum used shall be indicated on the plans;

(s) The engineer shall specify any special precautions or methods of construction necessary to prevent surface water pollution.

Source. #6590, eff 9-26-97

Env-Ws 702.03 Design Drawings for Sewage Pumping Stations.

(a) A location plan shall be submitted for projects involving construction or revision of pumping stations.

(b) The location plan shall include the following information:

- (1) The location and extent of the tributary area;
- (2) Any municipal boundaries within the tributary area; and
- (3) The location of the pumping station and force main, and all elevations.

(c) Detail plans shall be submitted including the following:

- (1) A contour map of the proposed pump station site;
- (2) Existing pumping station, location and elevations;
- (3) Proposed pumping station, including provisions for installation of future pumps or ejectors;
- (4) Elevation of high water at the site and maximum elevation of sewage in the collection system; and
- (5) Test boring logs and groundwater elevations.

Source. #6590, eff 9-26-97

Env-Ws 702.04 Plans of Wastewater Treatment Facilities.

(a) A location plan shall be submitted which shows the wastewater treatment plant in relation to the sewer system. Topographic features shall be included to indicate its location in relation to streams and the point of effluent discharge.

(b) Layouts of the proposed sewage treatment plant shall include the following:

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- (1) Topography of the site;
 - (2) Size and location of plant structures;
 - (3) Site boundaries including areas reserved for future expansion and all buildings or building lots within 600 feet of plant property;
 - (4) Schematic flow diagram showing the flow of sewage, supernatant liquor and sludge through the plant units;
 - (5) Piping, including any arrangements for bypassing individual units and the materials handled and direction of flow through pipes shall be shown; and
 - (6) Hydraulic profiles showing the minimum, average and maximum hydraulic flow elevations.
- (c) Detail plans shall include the following:
- (1) The location, dimensions and elevations of all existing and proposed plant facilities;
 - (2) The high and low water level elevations of the water body to which the plant effluent discharges, including the 100 year flood level;
 - (3) The type, size, pertinent features and manufacturer's rated capacity of all pumps, blowers, motors and other mechanical devices; and
 - (4) A description of any features not otherwise covered by specifications or engineer's report.

Source. #6590, eff 9-26-97

PART Env-Ws 703 SPECIFICATIONS

Env-Ws 703.01 Information Requirements.

- (a) Complete technical specifications for the construction of sewers, pumping stations, wastewater treatment facilities, and appurtenances shall accompany the design drawings.
- (b) The specifications shall describe the following information:
- (1) All construction information not shown on the drawings and which is necessary to inform the contractor of the design requirements and the quality of materials, workmanship and fabrication of the project;
 - (2) The type, size, operating characteristics and rating requirements of all mechanical and electrical equipment;
 - (3) Laboratory fixtures and equipment;
 - (4) Operating tools;

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- (5) Construction materials;
- (6) Special filter materials;
- (7) Appurtenances;
- (8) Chemicals when used;
- (9) Instructions for testing materials and equipment as necessary to meet design standards; and
- (10) Operating tests for the completed works and component units.

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Env-Ws 703.02 Bidding Requirements. The following bidding requirements shall apply to state and federally funded construction projects:

- (a) The bid period shall be of a duration of not less than 30 calendar days;
- (b) The advertisement for bids shall include the following information:
 - (1) The project name and contract number;
 - (2) The location of work;
 - (3) A description of work to be performed;
 - (4) The names and addresses of persons receiving bids;
 - (5) The time and date at which the bids will be publicly opened and read aloud, and a statement that bids received after this time will not be accepted;
 - (6) An address and cost information for obtaining plans and specifications with refund details for returned plans; and
 - (7) Addresses where plans and specifications can be examined;
- (c) A bid security in the amount of 10% of the bid and made payable to the owner shall be submitted in the form of a certified check or a bid bond executed by a surety company authorized to do business in New Hampshire;
- (d) The successful bidder shall furnish a 100% performance bond and a 100% payment bond;
- (e) The successful bidder shall be required to execute the contract agreement within 10 days following notification of the acceptance of his bid; and
- (f) The owner shall reserve the right to:
 - (1) Reject any or all bids;

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- (2) Accept any bid;
- (3) Waive any informality on bids received; and
- (4) Omit any bid item.

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Env-Ws 703.03 Technical Specifications for Pipe. The technical specifications shall specify the approved pipe and materials to be used on the project, as follows:

(a) Ductile iron pipe and fittings shall conform to the following standards of the American Water Works Association:

- (1) AWWA C151 for ductile iron pipe, centrifugally cast in metal or sand lined molds, for water or other liquids;
- (2) AWWA C150 for thickness design of ductile iron pipe and with ASTM A 536 ductile iron castings; and
- (3) Joints shall be mechanical type, push-on type, or ball-and-socket type;

(b) Plastic gravity sewer pipe and fittings shall comply with the standards listed in Table 703-1 below:

TABLE 703-1 Plastic Pipe

<u>ASTM Standard</u>	<u>Generic Pipe Material</u>	<u>Sizes Approved</u>
D3034	*PVC (solid wall)	8" through 15" (SDR 35)
F679	PVC (solid wall)	18" through 27" (T-1 & T-2)
F789	PVC (solid wall)	4" through 18" (T-1 to T-3)
F794	PVC (ribbed wall)	8" through 36"
D2680	*ABS (composite wall)	8" through 15"
*PVC: poly vinyl chloride		
*ABS: acrylonitrile-butadiene-styrene		

(c) Plastic sewer pipe shall have a pipe stiffness rating of at least 46 pounds per square inch at 5% pipe diameter deflection, as measured in accordance with ASTM D2412 during manufacture;

(d) Joint seals for PVC pipe shall be oil resistant compression rings of elastomeric material conforming to ASTM D3212 and shall be push-on, bell-and-spigot type;

(e) PVC pipe used for force mains shall conform to ASTM D2241 or ASTM D1784;

(f) Force mains shall be designed to withstand hydrostatic pressures of at least 2 1/2 times the design total dynamic head;

(g) Prestressed concrete cylinder pipe and fittings shall conform to AWWA C301 standard; and

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(h) Joints for concrete cylinder pipe shall be made of oil resistant elastomeric material conforming to AWWA C301 specification.

Source. #6590, eff 9-26-97

Env-Ws 703.04 Leakage Testing.

(a) All new sewers, manholes, and force mains shall be tested for water tightness by the use of either water or low-pressure air tests.

(b) Low pressure air testing shall be in conformance with ASTM C828.

(c) The rate of infiltration or exfiltration shall be not greater than 100 gallons per day per inch of pipe diameter per mile of pipe for sizes to 48", and not greater than 200 gallons per day per inch of pipe diameter per mile for sizes over 48".

(d) Force mains shall be tested in accordance with section 4 of AWWA C600 "Installation of Cast Iron Water Mains", at a pressure equal to 150% of the design operating total dynamic head.

(e) Manholes shall be tested for leakage using either a water exfiltration test or a vacuum test.

(f) The manhole vacuum test shall conform to the following:

(1) The initial vacuum gauge test pressure shall be 10" Hg ; and

(2) The minimum acceptable test hold time for a 1" Hg pressure drop to 9" Hg shall be:

a. Not less than 2 minutes for manholes less than 10 feet in depth;

b. Not less than 2 1/2 minutes for manholes 10-15 feet deep; and

c. Not less than 3 minutes for manholes more than 15 feet deep;

(g) The manhole shall be repaired and retested if the test hold times fail to achieve the acceptance limits specified in (f) above.

(h) All plastic sewer pipe shall be deflection tested not less than 30 days following installation.

(i) The maximum allowable deflection of flexible sewer pipe shall be 7 1/2% of average inside diameter.

Source. #6590, eff 9-26-97

PART Env-Ws 704 REVISIONS TO APPROVED PLANS AND EXISTING FACILITIES

Env-Ws 704.01 Revision to Approved Plans. Any deviations from approved plans or specifications shall be approved in accordance with these rules in writing before such changes are made. Plans or specifications so revised shall be submitted at least 30 days in advance of any construction work which will be affected by such changes.

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Env-Ws 704.02 Revisions to Existing Facilities. When a modification or an addition to an existing facility is proposed, the engineer shall submit a construction sequence for maintaining facility operations.

Source. #6590, eff 9-26-97

PART Env-Ws 705 INNOVATIVE AND ALTERNATIVE TECHNOLOGIES

Env-Ws 705.01 Purpose and Scope.

(a) The purpose of this part is to provide the methodology and review process for the evaluation and approval of innovative and alternative wastewater treatment and conveyance technologies in compliance with RSA 485-A:4,IX.

(b) This part shall apply to all wastewater treatment and conveyance technologies subject to review and approval under Env-Ws 701-704 and Env-Ws 706-715, and not expressly described therein.

Source. #6590, eff 9-26-97

Env-Ws 705.02 Definitions. For the purpose of this part, the following definitions, in addition to the definitions found at Env-Ws 701.02, shall apply:

(a) "Conventional technology" means wastewater treatment and conveyance technologies for which design criteria are established in Env-Ws 701-704 and Env-Ws 706-715.

(b) "Discharge permit" means a national pollutant discharge elimination system (NPDES) permit or a New Hampshire groundwater discharge permit.

(c) "Innovative/alternative waste treatment (I/A technologies)", as defined in RSA 485- A:2,XXI, includes all technologies not considered conventional technologies.

Source. #6590, eff 9-26-97

Env-Ws 705.03 Financial Requirements.

(a) The owner shall operate and maintain innovative and alternative wastewater treatment and conveyance systems in accordance with all applicable laws and rules.

(b) The owner shall replace an innovative or alternative system if the technology fails to meet the intended purpose or discharge permit limits or other requirements.

Source. #6590, eff 9-26-97

Env-Ws 705.04 Use of I/A Technology. No innovative or alternative wastewater treatment and conveyance technologies shall be used in a full scale application or in a pilot test at a municipal facility until the technology has been evaluated and approved by the department.

Source. #6590, eff 9-26-97

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Env-Ws 705.05 I/A Technology Review Process.

- (a) Anyone proposing an I/A technology shall submit a request for approval of the technology which includes:
- (1) A narrative describing the proposed technology;
 - (2) A discussion of applications or demonstration projects using the technology; and
 - (3) The benefits expected from its use.
- (b) If the proposed technology has not been fully proven but has been developed in documented research and demonstration projects, a technology assessment report shall be prepared and submitted to the department for review in accordance with Env-Ws 705.06.
- (c) If the proposed technology has been proven in other applications, and there are a number of existing full scale applications and design criteria can be found in existing literature, then a basis of design shall be prepared and submitted in accordance with Env-Ws 705.07.

Source. #6590, eff 9-26-97

Env-Ws 705.06 Technology Assessment Report Submittal and Review.

- (a) The technology assessment report shall include:
- (1) A written description of the proposed I/A technology;
 - (2) A history of where and when the technology was developed;
 - (3) All operational reports, technical reports and laboratory reports that resulted from research or demonstration projects;
 - (4) A full listing of all applications and tests of the technology;
 - (5) Records regarding the length of time the technology has been operated and evaluated and the climate conditions under which the testing was conducted;
 - (6) Documentation of flow rates, volumes and pollutant loadings during demonstration projects and a discussion of how these loadings would relate to full scale operation;
 - (7) A discussion of how the design criteria for the technology have been developed; and
 - (8) A discussion of the advantages of the proposed technology and risks associated with adoption of the technology.
- (b) The department shall evaluate the technology assessment report using the following criteria:
- (1) Whether the proposed technology offers significant advantages over conventional technology in at least one of the following areas:

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- a. Reduction of life cycle costs;
- b. More efficient use of energy or resources;
- c. Elimination or reduction of discharge of pollutants; or
- d. Recycling, reclamation or re-use of byproducts of the process.

(2) Whether the technology appears promising based upon the results of research and demonstration projects with benefits that outweigh the element of risk; and

(3) Whether the expected treatment results satisfy the requirements of the discharge permit.

(c) The department shall respond to the technology assessment report within 60 days based upon its review of the information submitted.

(d) The department's response shall indicate approval, approval with conditions, rejection, or request for more information.

(e) The response shall be in writing and shall specifically state the reason(s) for the department's decision.

Source. #6590, eff 9-26-97

Env-Ws 705.07 Basis of Design.

(a) Upon approval or conditional approval of the technology assessment report, or pursuant to Env-Ws 705.05(c), a basis of design shall be submitted for the proposed project.

(b) The basis of design shall include:

(1) Present and future conditions for:

- a. Population served;
- b. Flow; and
- c. Organic, solid and nutrient loadings;

(2) Preliminary design concept;

(3) Unit process loading rates;

(4) Cost estimates;

(5) Implementation schedule; and

(6) A demonstration that any conditions of approval have been satisfied.

(c) The department shall respond to the basis of design within 60 days.

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(d) The department's response shall either accept or reject the proposed design criteria, as based on the criteria's ability to satisfy the requirements of the discharge permit.

(e) Acceptance of the basis of design shall constitute authorization to proceed with final design for the subject I/A technology project.

Source. #6590, eff 9-26-97

Env-Ws 705.08 Final Plans. After acceptance of a basis of design, final plans and specifications shall be prepared and submitted for review and approval in accordance with Env-Ws 702.

Source. #6590, eff 9-26-97

Env-Ws 705.09 Performance Assessment.

(a) During the first year of operation, 2 reports of performance shall be submitted to the department, the first after 6 months of operation and the second after 12 months of operation.

(b) The owner may request that the performance assessment report schedule be extended in accordance with Env-Ws 705.10.

(c) The performance assessment report shall include:

- (1) Sampling and analysis results for influent and effluent parameters;
- (2) Calculated loading rates during the performance period;
- (3) Power requirements;
- (4) Discussion of system performance process parameters determined to be critical to proper operation and adjustments made during performance period; and
- (5) An assessment of system's ability to meet effluent criteria.

(d) The department shall review the performance assessment report and grant the system permanent approval if it determines that:

- (1) The system is capable of consistently meeting the limits of the discharge permit at proposed loadings based upon performance during the assessment period; and
- (2) No permit violations occurred during the performance assessment period for at least 3 consecutive months.

(e) If the department cannot, based upon the criteria in (c) above, accept the system, an action plan to obtain satisfactory performance shall be prepared and submitted to the department. The action plan shall clearly establish the causes of unsatisfactory performance and propose corrective measures.

(f) The department shall accept the plan if the proposed corrective measures appear adequate to remedy the cause(s) of the unsatisfactory performance. If the action plan is accepted by the department, the system shall undergo

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one additional year of temporary operation and 2 additional performance reports shall be submitted to the department.

(g) If the action plan is not acceptable or if the system does not meet the criteria in (c) above, the system shall be removed or replaced by a conventional system.

Source. #6590, eff 9-26-97

Env-Ws 705.10 Extension of Performance Assessment Period.

(a) If an owner of an I/A system determines that the performance assessment cannot be completed in one year, the owner may request an extension.

(b) The request for extension shall be in writing and shall contain the following information:

- (1) Facility name and location;
- (2) Date of I/A technology approval;
- (3) Type of I/A technology system;
- (4) Reason(s) why the performance assessment cannot be completed in one year;
- (5) Steps that will be taken to complete the performance assessment; and
- (6) Estimated amount of additional time required to fully assess the system.

(c) The request shall be filed not less than one month prior to the end of the 1-year assessment period.

(d) The department shall grant the extension if it finds that:

- (1) The performance assessment cannot reasonably be completed in one year; and
- (2) The steps identified by the owner appear adequate to fully assess the I/A technology system.

Source. #6590, eff 9-26-97

PART Env-Ws 706 DESIGN OF SEWERS

Env-Ws 706.01 Type of Sewers.

(a) All new sewerage systems or extensions shall be designed as separated sanitary and storm systems.

(b) Rain water from roofs, streets and other areas, and groundwater from foundation drains shall be excluded from the sanitary sewer.

Source. #6590, eff 9-26-97

Env-Ws 706.02 Design Period. Sewer systems shall be designed for the estimated ultimate tributary population.

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Source. #6590, eff 9-26-97

Env-Ws 706.03 Design Flow Basis.

- (a) New collector sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 70 gallons per day.
- (b) New sewers shall be designed to carry the peak hour flowrate, which flowrate shall be calculated as the product of the average daily flowrate for the service area multiplied by a peaking factor, plus an infiltration allowance.
- (c) Peaking factors for average daily flowrates in excess of 100,000 gallons per day shall be as derived from Figure 5-1 of Metcalf & Eddy's "Wastewater Engineering", third edition. A peaking factor of 6 shall be used for average daily flows less than 100,000 gallons per day.
- (d) Sanitary waste from commercially or industrially zoned areas shall be measured, if existing, or shall be estimated on the basis of the following:
 - (1) For industrial parks, not less than 2,000 gallons/day/gross acre;
 - (2) For shopping centers, not less than 2,000 gallons/day/gross acre; and
 - (3) For supermarkets, not less than 3,500 gallons/day/market.
- (e) Design of trunk sewers shall be based on total contributory flow from the collection system served, but in no case shall the flow be based on less than 2 1/2 times the average flow of the tributary system.
- (f) Infiltration allowance for the design of sewers shall be as follows:
 - (1) For areas to be sewerred in the future, an infiltration allowance of 150 gallons per day per acre shall be used;
 - (2) For sewers under design, an allowance of 300 gallons per inch diameter per mile per day shall be made; or
 - (3) For existing sewers to be intercepted by the sewer or interceptor under design, infiltration shall be measured.

Source. #6590, eff 9-26-97

Env-Ws 706.04 Details of Design and Construction.

- (a) No sewer shall be smaller than 8 inches in diameter.
- (b) Sanitary sewers shall be buried to a minimum depth of 6 feet below grade in all roadway locations, and to a minimum depth of 4 feet below grade in all cross-country locations.
- (c) All sewers shall be designed and constructed at such slopes as to prevent deposition of organic solids. This shall mean a minimum flow velocity for design purposes of 2 feet per second when flowing full.

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(d) The minimum allowable slope shall be as set forth in Table 706-3 below.

Table 706-3 Minimum Pipe Slope

<u>Nominal Pipe Diameter</u>	<u>Minimum Slope</u>	
8 inch	.0040	feet per foot
10 "	.0028	"
12 "	.0022	"
14 "	.0017	"
15 "	.0015	"
16 "	.0014	"
18 "	.0012	"
21 "	.0010	"
24 "	.0008	"
27 "	.0007	"
30 "	.0006	"
36 "	.0005	"

(e) Sewers smaller than 48 inches in diameter shall be laid with straight alignment between manholes.

(f) When a smaller sewer joins a larger one, the invert of the larger sewer shall be lowered sufficiently to maintain the same hydraulic gradient. An approximate method which may be used for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

(g) A reduction in the size of the outgoing sewer from a manhole shall be allowed only on sewers larger than 24" diameter and only if the capacity of the outgoing sewer is not exceeded.

(h) Where velocities greater than 10 feet per second are attained, provisions shall be made to protect against displacement by erosion and shock.

(i) Sewers shall be constructed of materials set forth in Env-Ws 703.03.

(j) Sewers crossing streams or located within 10 feet of a stream embankment shall be protected against erosion.

Source. #6590, eff 9-26-97

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Env-Ws 706.05 Trench Construction.

(a) Pipe trench bedding material and fill material for ordered excavation below grade shall be screened gravel or crushed stone to ASTM C33 stone size No. 67.

(b) Pipe sand blanket material shall be graded sand free from organic materials, so graded that 100% passes a 1/2 inch sieve and a maximum of 15% passes a #200 sieve. The sand blanket shall cover the pipe to a depth of 12 inches.

(c) Pipe bedding material shall extend from a horizontal plane through the pipe axis to 6 inch below the bottom of the pipe outside surface.

(d) Pipe sand blanket material shall cover the pipe a minimum of 12 inches above the crown of the outside surface.

(e) Compaction shall be in 12 inch layers for bedding and blanket materials.

(f) Backfill material shall be compacted in 3 feet layers to the ground surface except for road construction where the final 3 feet shall be compacted in 12 inch layers to the road base surface.

(g) Trench backfill material in roadway locations shall be natural materials excavated from the trench during construction, excluding:

- (1) Debris;
- (2) Pieces of pavement;
- (3) Organic matter;
- (4) Top soil;
- (5) Wet or soft muck;
- (6) Peat or clay;
- (7) Excavated ledge material;
- (8) Rocks over 6 inches in the largest dimension; and
- (9) Any material not approved by the engineer.

(h) Trench backfill at cross-country locations shall be as described in (g) above, except that top soil, loam, muck or peat may be used provided the completed construction will be stable, and provided that access to the sewer for maintenance and reconstruction is preserved.

(i) Backfill shall be mounded 6 inches above original ground.

(j) Base course for trench repair shall meet the requirements of section 300 of the standard specifications for road and bridge construction of the New Hampshire department of transportation.

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(k) Where sheeting is placed alongside the pipe and extends below mid-diameter, it shall be cut off and left in place to an elevation not less than one foot above the top of the pipe. Where sheeting is to be left in place, it shall be cut off at least 3 feet below finished grade, but not less than one foot above the top of the pipe.

(l) Trench dimensions shall be as follows:

(1) For sewer pipe up to 15 inches in diameter, allowable trench width at plane 12 inches above pipe shall be no more than 36 inches; and

(2) For pipe larger than 15 inches, the allowable width shall be equal to the pipe outside diameter plus 24 inches.

(m) Trenches for sewer pipes with slopes over .08 feet per foot shall have trench dams to lower possible groundwater flow velocity and potential disturbance to pipe zone materials.

(n) Precaution shall be taken to avoid groundwater pooling at the surface by drainage to a suitable outlet at catch basins or run-off swales.

Source. #6590, eff 9-26-97

Env-Ws 706.06 Manholes.

(a) All component parts shall have the strength, leak resistance, and space necessary for the intended service.

(b) Manhole structures shall have a life in excess of 25 years.

(c) Manhole structures shall be designed to withstand H-20 loading and shall not leak in excess of one gallon per day per vertical foot of manhole for the life the structure.

(d) Barrels and cone sections shall be constructed of precast reinforced or non-reinforced concrete, or poured-in-place reinforced or non-reinforced concrete.

(e) Base sections shall be of monolithic construction to a point 6" above the crown of the incoming pipe.

(f) Horizontal joints between sections of precast concrete barrels shall be of an overlapping type, which shall depend for water-tightness upon an elastomeric or mastic-like sealant.

(g) Pipe to manhole joints shall be as follows:

(1) Elastomeric, rubber sleeve with watertight joints at the manhole opening and pipe surfaces;

(2) Cast into the wall or secured with stainless steel clamps;

(3) Elastomeric sealing ring cast in the manhole opening with seal formed on the surface of the pipe by compression of the ring; and

(4) Non-shrink grouted joints where watertight bonding to the manhole and pipe can be obtained.

(h) Manhole cone sections shall be eccentric in shape.

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(I) All precast sections and bases shall have the date of manufacture and the name or trademark of the manufacturer impressed or indelibly marked on the inside wall.

(j) Manholes shall have a brick paved shelf and invert constructed to conform to the size of pipe and flow. At changes in direction, the inverts shall be laid out in curves of the longest radius possible tangent to the center line of the sewer pipes. Shelves shall be constructed to the elevation of the highest pipe crown and sloped to drain toward the flowing through channel. Underlayment of invert and shelf shall consist of brick masonry. Inverts and shelves shall be placed after testing.

(k) Materials of construction for manholes shall be as follows:

(1) Concrete for poured-in-place bases or complete manholes shall conform to the requirements for class A concrete in the New Hampshire department of transportation's standard specifications for road and bridge construction;

(2) Reinforcing steel for poured-in-place concrete shall conform to the requirements for billet-steel bars and welded steel wire fabric in the New Hampshire department of transportation's standard specifications for road and bridge construction;

(3) Precast concrete barrel sections, cones, and bases shall conform to ASTM C478 except as may be otherwise shown in these rules;

(4) The manhole frame and cover shall provide a 30" diameter clear opening;

(5) The manhole cover shall have the word "SEWER" in 3" letters cast into the top surface;

(6) The castings shall be of even-grained cast iron, smooth and free from scale, lumps, blisters, sand holes and defects;

(7) Contact surfaces of covers and frames shall be machined at the foundry to prevent rocking of covers in any orientation;

(8) Castings shall be equal to class 30, conforming to ASTM A48.

(9) Coatings for frames and covers shall be specified in the construction specifications;

(10) Brick masonry for shelf, invert and grade adjustment shall comply with ASTM C32, clay or shale, for grade SS hand brick;

(11) Mortar shall be composed of portland cement and sand with or without hydrated lime addition;

(12) Proportions of parts by volumes shall be:

a. 4 1/2 parts sand and 1 1/2 parts cement; or

b. 4 1/2 parts sand, one part cement and 1/2 part hydrated lime;

(13) Cement shall be type II portland cement conforming to ASTM C50;

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- (14) Hydrated lime shall be type S conforming to the ASTM C207 "Standard Specifications for Hydrated Lime for Masonry";
- (15) Sand shall consist of inert natural sand conforming to the ASTM C33 "Standard Specifications for Concrete, Fine Aggregates";
- (16) Concrete for drop supports shall conform to the requirement for class A3000 concrete of the New Hampshire department of transportation's standard specifications for road and bridge construction, as follows:
- a. Cement at 6.0 bags per cubic yard;
 - b. Water at 5.75 gallons per bag of cement; and
 - c. Maximum size of aggregate one inch;
- (17) A flexible joint shall be provided within the following distances from any manhole joint:
- a. Within 48" for RCP and CI pipe;
 - b. Within 18" for AC and ABS pipe up through 12" diameter;
 - c. Within 36" for AC and ABS pipe larger than 12" diameter; and
 - d. For DI pipe, no flexible joint required;
 - e. For PVC pipe up through 15" diameter, no flexible joint required;
 - f. Within 60" for PVC pipe larger than 15" diameter; and
 - g. For ABS pipe, same as for AC pipe above;
- (18) When manhole depth is less than 6 feet, a reinforced concrete slab cover may be used in lieu of a cone section. Such slab shall have an eccentric entrance opening and be capable of supporting H-20 loads.
- (l) Manhole steps shall:
- (1) Be permitted only at the request of the system owner. Such steps shall be used as secondary entry means if a portable ladder is not available;
 - (2) Be manufactured of 5/8" round stainless steel or forged aluminum alloy or plastic covered steel or aluminum;
 - (3) Be shaped so that they cannot be pulled out of the concrete wall into which they are secured;
 - (4) Meet the requirements of ASTM C478 for load carrying capacity and pull-out resistance;
 - (5) Not be secured with mortar;

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- (6) Be approximately 14" x 10" in dimension;
- (7) Have a drop section or raised abutments to prevent sideways slippage off the step; and
- (8) Have non-skid safety serrations on the foot contact surfaces.

(m) Manholes shall be installed at the end of each sewer line, at all intersections, and at all changes in grade, size or alignment. In establishing a maximum space between manholes, the engineer shall take cognizance of the cleaning equipment the owner already has on hand or proposes to obtain. In no case shall the distance between manholes be greater than 500 feet for sewers up to and including 48" in diameter, nor greater than 1000' for sewers larger than 48".

(n) A drop entry pipe shall be provided for any sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. The drop pipe may be constructed internal or external to the manhole.

(o) The limits to the size and number of internal drop pipes within a manhole shall be as follows:

- (1) For 4'-0" diameter manholes, one 10" internal drop pipe; and
- (2) For 5'-0" diameter manholes, one 15" or two 10" diameter drop pipes.

(p) Where the difference in elevation between the incoming sewer and the manhole outlet invert is less than 24 inches, the slope of the incoming sewer shall be increased to meet the manhole invert for the entire length of the sewer to the next upstream manhole. Invert slopes of manholes shall not exceed 0.13 foot per foot.

(q) The minimum internal diameter of manholes shall be 48 inches. For sewers larger than 24" diameter, manhole diameters shall be increased so as to provide at least 12" of shelf on each side of the sewer.

(r) In the flow channel, a drop of at least 0.1 feet shall be provided between incoming and outgoing sewers on all junction manholes and on manholes with bends greater than 45°.

(s) Watertight manhole covers shall be used wherever the manhole tops may be flooded by street runoff or high water.

(t) Electrical equipment installed or used in manholes shall conform to Env-Ws 707.01(20), (21) and (22).

(u) Precast bases shall be placed on a 6" layer of compacted bedding material. Bedding shall conform to ASTM C33 No. 67 stone. The excavation shall be properly dewatered while placing bedding material and setting the base or pouring concrete. Water-stops shall be used at the horizontal joint of poured-in-place manholes.

(v) Inlet and outlet stubs shall be connected and sealed in accordance with the manufacturer's recommended procedure, or cast integrally with the poured base.

(w) Barrel sections and cones of the appropriate combination of heights shall be placed according to manufacturer's recommended procedure for sealing the horizontal joints, or the remaining barrel of the manhole shall be cast above the base.

(x) A leakage test shall be performed.

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(y) Following completion of the leakage test, the frame and cover shall be placed on the top of the manhole or some other means used to prevent accidental entry by unauthorized persons, children, or animals, until the contractor is ready to make final adjustment to grade.

Source. #6590, eff 9-26-97

Env-Ws 706.07 Inverted Siphons. Inverted siphons shall have not less than 2 barrels with a minimum pipe size of 6 inches. Maintenance manholes and appurtenances shall be provided to facilitate convenient flushing and maintenance of the siphons. Pipe sizes and a hydraulic head shall be selected to secure velocities of at least 3.0 feet per second for average flows. The inlet and outlet details shall be arranged so that flow is diverted to one barrel, and so that either barrel may be cut out of service.

Source. #6590, eff 9-26-97

Env-Ws 706.08 Sewer Connection Permit.

- (a) A sewer connection permit request shall be submitted to the department for:
- (1) Any proposed sewerage, whether public or private;
 - (2) Any proposed wastewater connection or other discharge in excess of 5,000 gallons per day;
 - (3) Any proposed wastewater connection or other discharge to a wastewater treatment facility operating in excess of 80% design flow capacity; and
 - (4) Any proposed connection or other discharge of industrial wastewater, regardless of quality or quantity.
- (b) The applicant shall provide the following on a sewer connection permit request form available from the department:
- (1) The name of the municipality;
 - (2) The length, size and location of extension and/or connection to the existing collection system;
 - (3) The quantity or flowrate of proposed wastewater discharge;
 - (4) A request for department authorization to add the proposed wastewater discharge to the municipal sewage collection, treatment and disposal system;
 - (5) A statement as to whether the receiving sewers and wastewater treatment facility suffer from hydraulic surcharging or overloads;
 - (6) A statement as to whether the proposed sewer connection meets with the approval of the planning and zoning boards, engineering department and other authorities concerned;
 - (7) The signature and title of an authorized municipal official; and
 - (8) Such additional information as required under Env-Ws 904 for industrial wastewater discharges.

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(c) A permit review fee or design review fee in the amount stipulated in RSA 485-A:4 shall accompany the sewer connection permit request and applicable engineering plans.

(d) The department shall issue a sewer connection permit only if the receiving wastewater treatment facility is, or will be, capable of adequately processing the added hydraulic flow and organic load at the time of connection.

Source. #6590, eff 9-26-97

Env-Ws 706.09 Protection of Water Supplies.

(a) There shall be no physical connection between a public or private potable water supply system and a sewer or sewer appurtenance which would permit the passage of sewage or polluted water into the potable supply. No water pipe shall pass through or come in contact with any part of a sewer or sewer manhole.

(b) No sewer shall be located within the well protective radii described in Env-Ws 378 for groundwater production wells.

(c) Sewers shall be located during design at least 10 feet horizontally from any existing or proposed water main.

(d) A deviation from the separation requirements of (c) above shall be allowed where necessary to avoid conflict with subsurface structures, utility chambers and building foundations, provided that the sewer is constructed as follows:

(1) Sewer pipe shall be class 52 ductile iron; and

(2) Joints shall be pressure tested with zero leakage at 25 pounds per square inch for gravity sewers, and at 1 1/2 times working pressure for force mains.

(e) Whenever sewers must cross water mains, the sewer shall be constructed as follows:

(1) Sewer pipe joints shall be located at least 9 feet horizontally from the water main;

(2) Sewer pipe joints shall be pressure tested with zero leakage at 25 pounds per square inch for gravity sewers, and at 1 1/2 times working pressure for force mains; and

(3) Vertical separation of the sewer and water main shall be not less than 18".

Source. #6590, eff 9-26-97

Env-Ws 706.10 Service Connections.

(a) Service connections shall use a sanitary tee or wye fittings for all new sewer construction.

(b) Shallow building connections shall have the sewer fitting set at 45^O to provide a gradual slope entry to the sewer.

(c) Service connections with vertical risers up to 4 feet may have the sewer fitting set vertically.

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(d) Service connections with a vertical rise greater than 4 feet shall be provided with added support by encasing the fitting and riser in concrete to form a chimney.

(e) Precast units that provide support equal to cast-in-place concrete encasements may be used.

(f) As an alternate to (d) above, service connections with vertical risers up to 12 feet may employ non-encased risers which protect against pipe penetration or failure at the fitting by the use of bell on bell connections. The sewer fittings shall be encased for support and be set at 45°.

(g) For existing sewers where fittings cannot be installed, saddle connections shall be used. Saddle joints shall be encased in concrete.

Source. #6590, eff 9-26-97

PART 707 SEWAGE PUMPING STATIONS

Env-Ws 707.01 Pumping Station Design Requirements.

(a) Pump stations shall be designed for uninterrupted operation under flood conditions of a 25-year frequency, and shall be protected against damage from 100-year floods. The station shall be readily accessible.

(b) The design of the wet well and the discharge manifold shall be designed to prevent grit settling back into pump discharge lines of pumps not operating.

(c) The following types of sewage pumping stations shall be allowed:

- (1) Dry well/wet well type design with pumps and drives located in a separate dry chamber with flooded suctions;
- (2) Suction lift type with pumps and drives in a separate dry chamber; and
- (3) Submersible type with pump and/or drives submerged.

(d) Sewage pumping stations shall meet the requirements of the following:

- (1) Wet and dry wells including their superstructure shall be completely separated;
- (2) Dry wells shall provide accessibility for the repair and removal of pumps, and provisions shall be made for the removal of pumps and motors;
- (3) Separate exterior entrances shall be provided to both wet wells and dry wells of pump stations;
- (4) For built-in-place stations, access to lower levels shall be by straight stairways with handrails;
- (5) Prefabricated stations may have ladders or spiral stairs;
- (6) Vertical distances between floors or rest landings shall not exceed 12 feet;
- (7) Safety barriers to prevent falling shall be provided at landings;

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- (8) Power elevators proposed for all deep stations shall have a capacity limit of not less than 600 pounds;
- (9) A minimum of 2 pumps, each designed to handle peak flows for at least 15 years hence, shall be provided;
- (10) Where 3 or more pumps are provided, they shall be designed such that, with any one unit out of service, the remaining units shall have the capacity to handle peak sewage flows;
- (11) Duplicate compressor units shall be required when ejectors are provided as the method of raising sewage;
- (12) The compressors shall be so interconnected that the duplicate unit will commence operation in the event of failure of the other;
- (13) All pumps shall be protected from damage due to large solid objects by bar screens or racks , which shall have 2" clear openings;
- (14) Pumps and pneumatic ejectors shall be capable of passing 3 inch solids, or 2 1/2-inch solids if preceded by a grinder unit;
- (15) Pumps with built-in comminuting devices shall be capable of passing 2 1/2 inch solids;
- (16) Submersible pumps shall be capable of removal without disconnecting pipes or dewatering and reseating using non-corroding guide rails or cables;
- (17) Lifting equipment shall be provided for submersible pump removal;
- (18) Self-priming suction lift pump systems shall be designed such that:
 - a. The system's reprime capacity is greater than the static suction head; and
 - b. The system's available net positive suction head is greater than the required net positive suction head.
- (19) The use of a vacuum pump for priming of suction lift stations as an alternate to self priming shall be limited to stations of 100 gallons per minute or less peak capacity;
- (20) Suitable devices for measuring and recording wastewater flow shall be provided at all pumping stations, as follows:
 - a. For pumping stations with capacities of more than 500 gpm, this shall consist of daily recording charts as well as a totalizer; and
 - b. For stations with capacities of 500 gpm or less, this may consist of a running meter which shall indicate the total running time of the pumps;
- (21) There shall be no physical connection between the potable water system and any other piping system and equipment ;

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- (22) Where potable water is used for pump sealing purposes, the potable water supply shall be protected by a break tank or reduced pressure zone back flow preventer;
- (23) Wet well design shall avoid turbulence near the pump suction intakes;
- (24) A separate sump pump capable of passing 1 1/2 inch solids shall be provided in the dry well to remove leakage or drainage, with the discharge above the alarm level of the wet well;
- (25) Water ejectors connected to a potable water supply shall be prohibited;
- (26) All floor and walkway surfaces shall slope to a point of discharge;
- (27) The pumps and controls of main pumping stations, including pumping stations operated as part of treatment works, shall be selected to operate at varying delivery rates to permit discharging sewage from the station to the treatment works at approximately its rate of delivery to the pump station;
- (28) Pumps shall be protected from being driven in the reverse direction;
- (29) Pump controls shall provide autostart of lag pump should lead pump fail to start;
- (30) Flooded suction pumping systems shall be designed such that:
 - a. Shut-off valves are provided in the suction piping;
 - b. Shut-off valves and check valves are provided in the discharge piping; and
 - c. Discharge shut-off valves are located downstream of the check valve;
- (31) Shut-off and check valves for submersible pumps shall be placed in a separate chamber for ease of maintenance;
- (32) Submersible pumps with integral check valves operated by a service rod shall be allowed for pumping capacities up to 100 gpm;
- (33) Wet wells for pumping stations of greater than 200 gpm capacity shall have division wells so that the station can be kept in operation when work is required in the wet well;
- (34) The effective capacity of the wet well shall provide a holding period not to exceed 10 minutes for the design average flow;
- (35) The wet well floor shall have a minimum slope of 1 to 1 to the hopper bottom.
- (36) The horizontal area of the hopper bottom shall be limited to that for proper installation and function of the inlet; and
- (37) A permanent ladder securely fastened to the wall of each wet well shall be installed so as to provide emergency egress;

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Source. #6590, eff 9-26-97

Env-Ws 707.02 Pumping Station Electrical Requirements.

- (a) Submersible pumps shall be:
 - (1) Suitable for installation in areas classified by the National Electrical Code as class 1, division 1; and
 - (2) Rated for class I, division 2 requirements when mechanical forced air ventilation is provided.
- (b) Motors, conduit, lights, boxes, switches, controls, shall be explosion proof when located within the wet well.
- (c) Electric motors shall be protected from flooding.
- (d) Electrical systems and components including motors, lights, cable, conduits, switch boxes and control circuits in enclosed or partially enclosed spaces where flammable mixtures occasionally may be present, including raw sewage wet wells, shall comply with the National Electrical Code requirements for class I, division 1 locations.
- (e) All electrical equipment and work shall comply with the requirements of the National Electrical Code.

Source. #6590, eff 9-26-97

Env-Ws 707.03 Pumping Station Ventilation Requirements.

- (a) Ventilation for personnel and equipment shall be provided for all pump stations.
- (b) Where the pump pit is below the ground surface, mechanical ventilation shall be provided, so arranged as to independently ventilate the dry well and the wet well.
- (c) There shall be no interconnection between the wet well and dry well ventilation systems.
- (d) Dampers shall not be used on exhaust or fresh air ducts;
- (e) Switches for operation of ventilation equipment shall be marked and located conveniently.
- (f) Dehumidification shall be provided in the below ground pump chambers.
- (g) Ventilation of wet wells shall provide at least 30 air changes per hour if the system is operated intermittently, or at least 12 air changes per hour if the system is operated continuously.
- (h) Fans installed within the wet well structure shall be made of non-spark material.
- (i) Ventilation of submersible pump chambers or suction lift wet wells where there is no occupancy for regular maintenance purposes, may be by gravity ventilation.
- (j) Ventilation exhaust from wet wells shall not cause an odor nuisance to the public or surrounding occupied building.

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(k) Access doors to wet wells shall have warning signs on underside which read, "warning hazardous area, enter only with proper equipment".

(l) Ventilation system of the dry well shall be capable of continuously providing at least 6 air changes per hour when the facility is occupied, and at least 3 changes per hour when not occupied.

Source. #6590, eff 9-26-97

Env-Ws 707.04 Alarm Systems.

(a) Alarm systems shall be provided for all pumping stations.

(b) The alarm signal shall be activated in any one of the following cases:

(1) High water in the wet well, activated independent the of pump bubbler system;

(2) Loss of one or more phases of power supply;

(3) High water level in the pump room sump;

(4) Loss of the alarm transmission line; or

(5) Hydrogen sulfide and/or methane gas warning in wet well chamber.

(c) The high water alarm trigger shall be a separate float-type or mercury-type switch, independent of the bubbler system.

(d) Satisfactory operation of the alarm system shall be indicated on a panel with a light which lights up upon failure of the alarm system.

(e) An enunciator panel shall be installed at the sewage treatment plant control room. Where a plant is not manned on a 24 hour/day basis, an additional enunciator panel shall be installed at the police station, fire station, or any other locale having 24 hour/day manning, including a commercial answering service. Alarm signals at privately operated pump stations shall be transmitted to the responsible maintenance person directly or by an answering service.

(f) The power source for the alarm system shall be:

(1) An independent battery with continuous charge; or

(2) Main line power with a back-up battery system, which shall be automatically connected should main power fail.

(g) The alarm signal shall be transmitted through the telephone system either leased or privately constructed, or by radio transmission.

(h) The alarm shall consist of an audible enunciator and a light.

(i) Provision shall be made to permit silencing of the audible enunciator manually, after the alarm has been

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sounded, but the light shall continue until the alarm condition has been rectified.

Source. #6590, eff 9-26-97

Env-Ws 707.05 Instruction and Equipment. Sewage pumping stations and their operators shall be supplied by the equipment supplier with a complete set of operational instructions, including recommendation for spares and maintenance.

Source. #6590, eff 9-26-97

Env-Ws 707.06 Emergency Operation.

(a) The engineer shall recommend emergency operation procedures to prevent the back-up, overflow or other discharge of wastewater from the pumping station.

(b) An independent engine-generator type source of electric power shall be provided for electrically-driven pumps. This source shall be automatically activated by failure of any phase of power supply or upon any fluctuation in voltage, the amount or duration of which would cause damage to the motors. Installations shall comply with all applicable requirements of the National Electric Code.

(c) The emergency power generator shall be permanently secured in place, with provisions for removal to facilitate generator repair or replacement.

(d) Provisions shall be made for automatic and manual start-up and cut-in. The controls shall be such that upon automatic start-up under emergency conditions, shut-down shall be accomplished automatically on restoration of utility power with controlled shut-down of unit. Manual shut down shall also be provided. Provision shall be made to allow pumps to run down before re-energizing on transfer of power.

(e) The emergency power generator shall be sized to sequentially start and operate all pumps needed to handle average waste flows, plus lighting, ventilation, controls and comminution.

(f) The emergency power generator shall be located above grade with ventilation of exhaust gases.

(g) All emergency power generation equipment shall be provided with instructions for routine exercising and load testing.

(h) Emergency power generation equipment shall be provided for operation of grinding, degritting, sedimentation, and disinfection process equipment, as well as for lighting, heating, ventilation and air conditioning equipment. Emergency power generation equipment shall also be provided to serve any equipment subject to damage by loss of power.

(i) The generator engine controls shall be equipped with an automatic exerciser which can be set on any selected schedule to start the generator, run it under no-load or load conditions by selection, and shut it off without actuating the alarm system.

(j) Alternatives to a generation set may be provided in the following circumstances:

(1) Pumping stations with capacities of 100 gallons per minute or less may utilize influent storage over and above normal operating system storage provided that:

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- a. The additional storage shall provide at least 6 hours of flow detention at average daily flow; and
- b. A suitable receptacle shall be included in the electrical supply panel for connection to a portable generator with manual transfer;

(2) For stations with duplex pumps located above grade where duration of power loss will not present freezing problems, a standby engine drive system which automatically starts on power loss to drive one pump may be furnished as an alternative to a permanent generator.

(k) No pumping station by-passes allowing the discharge of raw sewage either overland or to any water course shall be permitted.

Source. #6590, eff 9-26-97

Env-Ws 707.07 Force Mains.

- (a) Force mains shall be sized to yield a cleansing velocity of 3 feet per second or greater at design flow.
- (b) Force mains shall be provided with automatic air relief valve(s) at high points to prevent air locking.
- (c) Force mains shall enter the gravity sewer system at a point not more than 2 feet above the flow line of the receiving manhole.
- (d) Force mains shall be provided with drainage blow-offs, properly valved, at low points. Space shall be available at such locations for handling the displaced waste without danger of pollution or health hazard.
- (e) Force mains shall be constructed of ductile iron, polyethylene or PVC material.
- (f) Thrust blocks shall be placed at all bends, elbows, tees, and junctions.
- (g) Force mains shall be treated as gravity sewers for purposes of foundation bedding and backfill requirements.

Source. #6590, eff 9-26-97

PART Env-Ws 708 WASTEWATER TREATMENT FACILITIES

Env-Ws 708.01 Treatment Process. Wastewater treatment facilities shall be designed to comply with effluent discharge limitations of the state surface or ground water discharge permit.

Source. #6590, eff 9-26-97

Env-Ws 708.02 Design Period. Wastewater treatment facilities shall be designed to allow for expansion.

Source. #6590, eff 9-26-97

Env-Ws 708.03 Plant Location.

- (a) Treatment plants shall be located and designed such that the impact of possible odor problems and safety

and health problems to the adjacent properties shall be insignificant.

(b) Buffer distances shall be as follows:

- (1) Stabilization lagoons shall be located not closer than 600 feet from any single or multiple dwelling;
- (2) Aerated lagoons shall be located not closer than 400 feet from any single or multiple dwelling; and
- (3) Conventional treatment plants shall be located not closer than 300 feet from any single or multiple dwelling;

(c) Wastewater treatment facilities shall be designed to provide for uninterrupted operation of all process units during flooding conditions of a 25-year frequency and shall be placed above or protected against the 100 year flood levels. The plant layout shall be designed with a view toward ease of operation, safety, accessibility, and future expansion. Access roads shall be designed for safety, grade and intersection visibility.

Source. #6590, eff 9-26-97

Env-Ws 708.04 Design Basis.

(a) Wastewater treatment plants for a new sewer system shall be designed for an average domestic flow of not less than 70 gallons per capita per day, plus industrial and commercial waste, and infiltration, as required by these rules. The total flow so obtained shall be defined as the design flow. Domestic flows of less than 70 gallons per capita per day shall only be used when supported by engineering data.

(b) Where a sewer system is already in existence, actual gauging shall be used as a basis to estimate design flow to which is added an allowance for future increase in sewage design flow.

(c) The volume and strength of sewage in existing sewers shall be determined for both wet and dry weather periods.

(d) Laboratory analyses shall be made on composite samples taken over 24-hour periods. These data shall include composite samples for the maximum significant period of sewage and industrial waste discharge and shall cover a sufficient period of time to be representative of actual conditions.

(e) The basis of hydraulic loading shall be as follows:

- (1) The design of treatment units shall be based on the average rate of sewage flow per 24-hours, except where significant deviation from normal diurnal flow patterns are noted;
- (2) Industrial waste flows shall be determined from the observed rate of flow during the significant period of discharge;
- (3) Peak rates of flow taken over sufficient length of time to determine the affect on detention time of treatment units or the flow characteristics of conduits, shall be obtained; and
- (4) Hydraulic design calculations shall include flows resulting from wastewater recirculation.

(f) The basis of organic loading shall be as follows:

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- (1) Organic loading shall be based upon a minimum 5-day BOD content of .20 pounds per capita for domestic sewage, excepting when analyses based on composite samples indicate a higher actual BOD, the actual values shall be used;
 - (2) To (1) above, shall be added 5-day BOD values for industrial wastes;
 - (3) The suspended solids loading shall be assumed to be 0.25 pounds per capita per day for design purposes;
 - (4) All treatment plants shall be designed to receive and treat septage wastes; and
 - (5) Pretreatment of septage shall be required when it is shown that the additional sudden load could cause the plant processing control problems or when septage storage is planned.
- (g) All piping and channels shall be designed to carry the maximum expected flows.
- (h) The incoming sewer shall be designed for free discharge.
- (i) Pockets and corners where solids accumulate shall be eliminated.
- (j) Gates shall be placed in channels to seal off unused sections which might accumulate solids.
- (k) Component parts of the plant shall be arranged for greatest operating convenience, flexibility, economy, and so as to facilitate installation of future units.

Source. #6590, eff 9-26-97

Env-Ws 708.05 Plant Details.

- (a) Technical specifications shall be so written that the installation and initial operation of major items of mechanical equipment will be supervised by a representative of the manufacturer.
- (b) Except where duplicate units are available, by-pass structures shall be provided so that each unit of the plant can be removed from service independently.
- (c) Plant by-passes which allow raw or insufficiently treated sewage to be discharged directly to a water course shall be prohibited.
- (c) Means shall be provided to dewater each unit. Hydrostatic pressure relief devices shall be provided as necessary.
- (d) Construction materials shall be appropriate for the service conditions.
- (e) In order to facilitate identification of piping, different lines shall have contrasting colors and the following color scheme shall be followed:
- (1) Sewage lines shall be gray;
 - (2) Gas lines shall be red;

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- (3) Potable water lines shall be blue;
 - (4) Chlorine lines shall be yellow;
 - (5) Compressed air lines shall be green;
 - (6) Non-potable water lines shall be blue with 6-inch red bands spaced 30 inches apart;
 - (7) Recirculated sludge lines shall be brown; and
 - (8) Waste sludge lines shall be brown with 6-inch yellow bands spaced 30 inches apart.
- (f) A sludge-handling or grit-handling truck and a complete outfit of tools, unit spare parts, and accessories shall be included in the specifications.
- (g) Upon completion of the plant, the grounds shall be graded.
- (h) Concrete or gravel walkways shall be provided for access to all units.
- (i) Surface water shall not be permitted to drain into any process unit.
- (j) An operations building shall be provided. The building shall be heated, ventilated, and lighted.
- (k) Office, workshop with work bench, laboratory, and storage space shall be provided for operation of the plant.
- (l) Yard piping for sewage shall be of cast iron or ductile iron. Piping for drainage may be of other materials having proper strength characteristics.
- (m) Piping located under plant units shall be avoided when possible; but if not, the piping shall be ductile iron, concrete encased with approved joints.
- (n) All electrical equipment and work shall comply with the requirements of the National Electrical Code for the service involved.

Source. #6590, eff 9-26-97

Env-Ws 708.06 Plant Outfalls.

- (a) Provision shall be made for effective dispersion of the effluent into the receiving water body.
- (b) The outfall sewer shall extend to the low water level of the receiving body to ensure the effective dispersion of the effluent. It shall have its outlet submerged.
- (c) The outfall sewer shall be so constructed and protected against the effects of flood water, tides, ice or other hazards as to reasonably ensure its structural stability and freedom from stoppage.
- (d) Outfall sewers shall not be hazardous to navigation.

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(e) A manhole shall be provided at the shore end of all gravity outfall sewers extending into the receiving stream.

Source. #6590, eff 9-26-97

Env-Ws 708.07 Essential Facilities.

(a) A standby electric generator set to operate essential equipment shall be provided. This system shall be automatically activated upon failure of any one phase of the electric power.

(b) Water supply basic requirement shall be as follows:

(1) A supply of potable water under pressure shall be provided for use in the laboratory and for general cleanliness around the plant;

(2) No piping or other connections shall exist in any part of the treatment works which might cause the contamination of a potable water supply;

(3) The chemical quality shall be checked for suitability for its intended uses such as heat exchangers and chlorinators;

(4) Potable water from a municipal or separate supply may be used directly at points above grade for the following hot and cold supplies:

- a. Lavatory sink;
- b. Toilet;
- c. Shower;
- d. Drinking fountain; and
- e. Laboratory;

(5) Hot water for any unit cited in (4) above shall not be taken directly from a boiler used for supplying hot water to a sludge heat exchanger or digester heating coils.

(6) Vacuum breakers shall be fitted on the water supply to the laboratory;

(7) Where a potable water supply is to be used for any purpose in a plant other than those listed above, a break tank, pressure tank or reduced pressure zone backflow protector shall be provided;

(8) Water shall discharge to the break tank through an air-gap at least 6 inches above the maximum flood line or the spill line of the tank, whichever is higher;

(9) A sign shall be permanently posted at every hose bib, faucet or sill cock located on the water system beyond the break tank or backflow preventer labeled "unfit for drinking"; and

(10) Fire hydrants supplied by potable water shall be located outside of perimeter fence.

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(11) Hydrants may be located inside the fence if the hydrant loop is protected from the potable water supply by a reduced zone backflow preventer.

(c) The operations building shall be provided with sanitary facilities, including drinking water, toilet, shower and lavatory.

(d) All treatment works shall include a laboratory for analytical determinations and operating control tests. Isolation shall be such as to render the laboratory free from the adverse effects of noise, heat, vibration and dust.

(e) Wastewater flow measurement and monitoring shall be provided as follows:

- (1) Means for continuous measuring, indicating and recording of the sewage flows shall be installed;
- (2) Meters shall be installed in such manner and location as to provide a true indication of influent and effluent flows;
- (3) The effluent meter shall be placed ahead of the chlorine contact tank;
- (4) Monitoring stations shall be provided for collecting influent and effluent samples.
- (5) Monitoring stations shall not be located in locations classified by the National Electric Code as class 1, division 2;
- (6) The monitoring stations shall be located after comminution and before disinfection; and
- (7) Monitoring stations shall be provided with power and environmental controls placed within 5 feet of the sampling point.

(f) Floor surfaces shall be sloped adequately to a point of drainage.

(g) Stairways shall be installed with a slope of 30 to 35 degrees from the horizontal to facilitate carrying samples or tools. All risers in a stairway shall be of equal height.

(h) An alarm system as required by Env-Ws 707.03 shall be provided. Failure of the disinfection system shall activate an alarm.

(i) Means shall be provided for dewatering each treatment unit for inspection and maintenance without disrupting the treatment processes. Provisions shall be made to prevent flotation of the units.

(j) All treatment plants shall be provided with duplicate means for disinfection.

Source. #6590, eff 9-26-97

Env-Ws 708.08 Safety. Wastewater treatment facilities shall be equipped with the following safety provisions:

(a) Enclosure of the plant site with a fence designed to discourage the entrance of unauthorized persons and animals;

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- (b) Installation of hand rails and guards;
- (c) Provision of a first aid kit;
- (d) Posting of "No Smoking" signs in hazardous areas;
- (e) Protective clothing and equipment;
- (f) A portable blower and sufficient hose;
- (g) Machinery guards around belts or other moving parts;
- (h) Flame traps at all gas outlets;
- (i) Ventilation of enclosures;
- (j) Non-slip treads on stairs; and
- (k) Fire extinguishers at all fire hazard areas with a minimum of 15 pound CO₂ type for electric fire hazard areas, and 15 pound dry chemical type of non-electric fire hazard areas..

Source. #6590, eff 9-26-97

Env-Ws 708.09 Pre-assembled Treatment Plants. Pre-assembled or package treatment plants shall meet the same requirements as those pertaining to built-in-place plants.

Source. #6590, eff 9-26-97

Env-Ws 708.10 Operation of Treatment Plants. The engineer shall supervise the start-up and satisfactory operation of the plant for a minimum period of 6 months.

Source. #6590, eff 9-26-97

PART Env-Ws 709 SCREENING, GRIT REMOVAL AND SETTLING

Env-Ws 709.01 Comminuting and Screening Devices.

(a) All sewage treatment plants shall be provided with mechanical means for comminuting or screening coarse materials in the sewage. Operation of such mechanically-cleaned devices shall be continuous or automatically controlled.

(b) Screening devices and racks installed in a building where other equipment or offices are located shall be separated from the rest of the building, provided with separate outside entrances, and provided with mechanical ventilation.

(c) Clear openings between bars shall be from 1 to 1 3/4 inches for by-pass screens. Clearance for coarse racks or screens preceding mechanically-cleaned screens or comminutors may be greater than 1 3/4 inches. Design and installation of manually cleaned screens shall be such that they can be cleaned. Clear openings for mechanically cleaned screens shall be a minimum of 5/8". Manually cleaned screens, except those for emergency use, shall be

placed on a screen slope of 30 to 45 degrees with the horizontal.

(d) For manually cleaned bar screens, the screen chamber shall be designed to provide a velocity through the screen of one foot per second at an average rate of flow. For mechanically cleaned screens, maximum velocities during wet weather periods shall not exceed 2.5 feet per second. The velocity shall be calculated from a vertical projection of the screen openings on the cross-sectional area between the invert of the channel and the flow line.

(e) The screen channel invert shall be 3 to 6 inches below the invert of the incoming sewers. To prevent jetting action, the length and construction of the screen channel shall provide for a reestablished hydraulic flow pattern following the drop in elevation.

(f) All mechanical units which are operated by timing devices shall be provided with auxiliary controls which shall set the cleaning mechanism in operation at predetermined high water marks. Electrical equipment and systems shall comply with the National Electrical Code requirements for class I division 1 locations.

(g) Facilities shall be provided for removal, handling, storage, and disposal of screenings in a sanitary manner. Manually cleaned screening facilities shall include an accessible platform from which the operator can rake screenings easily and safely. Drainage facilities shall be provided both for the platform and for storage areas. Grinding of screenings and return to the sewage flow shall be a satisfactory method of disposal. Burial or incineration shall be an approved alternative method. Open area disposal shall be prohibited.

(h) Comminuting devices shall have slots not less than 1/4" wide and be designed to cut or shred material below the surface of the sewage.

(i) The capacity of units shall be:

(1) If one unit is installed, it shall be sized to handle peak flow;

(2) If 2 units are installed, each shall be sized each to handle peak flow;

(3) If more than 2 units are installed for flexibility of maintenance, the peak flow shall be handled with the largest unit out of service, by the remaining units; and

(4) Mercury seal on the comminutor shall be prohibited.

(j) Influent channels shall be equipped with the gates to isolate each screening or comminuting device. Provisions shall also be made for dewatering each unit. The channel preceding and following the comminutor or screen shall be shaped to eliminate stranding and settling of solids.

(k) Where mechanically operated screening or comminuting devices are used, auxiliary manually-cleaned screens shall be provided. Design shall include provisions for automatic diversion of the entire sewage flow through the by-pass screens should regular units fail.

(l) The use of fine screens in lieu of sedimentation alone shall be prohibited.

(m) For treatment plants with capacities up to 5.0 mgd, a minimum of one mechanically cleaned bar screen or comminutor shall be provided. For treatment plants with capacities of 5.0 mgd or greater, multiple mechanically cleaned bar screens or comminutors shall be provided.

Source. #6590, eff 9-26-97

Env-Ws 709.02 Grit Removal Facilities.

(a) Grit removal facilities shall be provided for all sanitary sewage treatment plants having a design capacity of 75,000 gallons per day or greater. If a plant serving a sanitary sewer system is designed without grit facilities, the design shall include provisions for future installation. Grit removal facilities shall be located ahead of pumps and comminuting devices. Grit removal facilities for plants treating wastes from combined sewers shall have at least 2 manually cleaned units, or one mechanically cleaned unit with a manual by-pass unit.

(b) Inlet turbulence shall be minimized. Grit chamber channels and flumes shall be designed to produce velocities of not less than 0.8 feet per second and not greater than 1.2 feet per second. Detention shall deposit grit coarser than 0.20 millimeter. Provision for dewatering shall be made. All mechanically-cleaned grit chambers shall be provided with means for washing the grit.

(c) Grit facilities located in deep pits shall be provided with mechanical equipment for pumping or hoisting grit to ground level. Such pits shall have a stairway or elevator, mechanical ventilation and lighting. Provisions shall be made for dewatering each unit. Impervious surfaces with drains shall be provided for grit handling areas. Grit conveying equipment shall be designed to avoid loss of material and protected from freezing. A supply of water under pressure shall be provided for cleanup.

Source. #6590, eff 9-26-97

Env-Ws 709.03 Pre-Aeration and Flocculation.

(a) Flocculation of sewage by air or mechanical agitation, with or without coagulating aids, shall be provided when it is desired to reduce the strength of sewage prior to subsequent treatment or to pretreat sewage containing industrial wastes.

(b) Flocculation units shall be designed so that removal from service will not interfere with normal operation of the remainder of the plant.

(c) Flocculent chemical, if used, shall be thoroughly dispersed and mixed with the sewage to yield a mixture of uniform composition.

(d) The flocculation tank shall be designed to maintain self-cleansing velocities across its floor.

Source. #6590, eff 9-26-97

Env-Ws 709.04 Settling Tanks.

(a) Inlets shall be designed to dissipate the inlet velocity, to distribute the flow equally and to prevent short-circuiting.

(b) Channels shall be designed to maintain a velocity of at least one foot per second at one-half design flow. Corner pockets and dead ends shall be eliminated.

(c) Provisions shall be made for elimination or removal of floating materials in inlet structures having submerged ports.

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(d) The minimum length of flow from inlet to outlet shall be 10 feet. Primary tanks shall have a minimum side water depth of 7 feet.

(e) Effective scum collection and removal facilities and baffling shall be provided ahead of the outlet weirs on all settling tanks. Scum troughs shall not be used as the sole means of effluent baffling. Provisions may be made for discharge of scum with the sludge.

(f) Overflow weirs shall be adjustable, loadings shall not exceed 10,000 gallons per day per linear foot of weir for plants designed for average flows of 1.0 mgd or less. For plants designed for flows in excess of 1.0 mgd, loadings shall not exceed 15,000 gallons per day per linear foot. Where pumping is required, pump capacity shall be related to tank design to avoid excessive weir loading.

(g) The tops of troughs, beams, and similar construction features which are submerged shall have a minimum slope of 1.4 vertical to one horizontal.

(h) At least 2 settling tanks shall be provided.

(i) All settling tanks shall provide safe and easy access for maintenance and protection to operators. Access stairways and elevated walkways shall be equipped with handrails. Walls of settling tanks shall extend a minimum of 6 inches above the surrounding ground surface, and be provided with safety railings, and shall have not less than 12 inches freeboard.

(j) Surface settling rates for primary tanks not followed by secondary treatment shall not exceed 600 gallons per day per square foot for plants having a design flow of 1.0 mgd or less.

(k) BOD removals for sewage containing industrial wastes shall be determined by laboratory tests and the quantity and characteristics of the waste taken into account in determining a settling rate.

(l) Surface settling rates for intermediate settling tanks shall not exceed 1,000 gallons per day per square foot based on their design flow.

(m) Final settling tanks shall be designed according to Table 709-4 below:

TABLE 709-4 Final Settling Tanks

<u>Type of Treatment</u>	<u>Surface Settling Rate (at Design Flow)</u>	<u>Side Water Depth(feet)</u>
Standard Rate Trickling Filter	800-1000 gpd/sf	7 to 8
High Rate Trickling Filter	600-800 gpd/sf	8 to 10
Activated Sludge		
Up to 2.0 mgd	600-800 gpd/sf	10 to 12
Over 2.0 mgd	600-1000 gpd/sf	10 to 12
Extended Aeration		

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Up to 50,000 gpd	200-400	gpd/sf	8 to 10
Over 50,000 gpd	400-600	gpd/sf	10 to 12
Oxidation Ditch	400-600	gpd/sf	8 to 10
Rotating Biologic			
Contactor (RBC)	450-650	gpd/sf	8 to 10

(n) For sludge removal, provision shall be made for:

- (1) Viewing, sampling, and measuring flow of the sludge;
- (2) Continuous sludge removal from final settling tanks, when the sludge is returned to primary settling tanks or aeration tanks;
- (3) Individually valved sludge withdrawal lines 6 inches minimum diameter;
- (4) A minimum of 30 inches pressure head for sludge withdrawals;
- (5) Sludge hoppers shall be accessible for maintenance from the operating level;
- (6) 1.7 horizontal to one vertical minimum slope of the side walls of sludge hoppers;
- (7) Clearance between the end of the sludge drawoff pipe and the hopper walls to prevent bridging of solids; and
- (8) Maximum dimension of 2 feet for hopper bottoms.

(o) Settling tanks designed for use without mechanical equipment for sludge collection and removal shall be prohibited.

(p) Air lift type of sludge removal shall be prohibited. Primary sludge shall be removed from the sludge hoppers by positive displacement pumps with timers for control of pumping periods.

(q) Combined units employing settling and digestion processes shall not be permitted for site built plants. Upward flow settling tanks may be used.

Source. #6590, eff 9-26-97

Env-Ws 709.05 Chemical Coagulation.

- (a) Chemical coagulants shall be applied at a rate proportional to the wastewater flow.
- (b) Rapid and thorough mixing of the wastewater and coagulant(s) shall be provided, with a detention period of not less than one minute based on design flow.
- (c) At least 2 flocculation tanks having a combined detention period of between 20 and 30 minutes shall be provided. Diffused air or paddles shall provide a continuous slow rotary agitation of the full content of the flocculation tanks. Independent controls for each tank shall be provided. Settling tank design shall conform to Env-

Ws 709.04. A means of dewatering all tanks shall be provided.

(d) Automatic control of feed pumps and feed equipment shall provide proportional feed to the sewage flow and annunciate by alarm any failed part of the process equipment.

Source. #6590, eff 9-26-97

PART Env-Ws 710 SLUDGE HANDLING AND DISPOSAL

Env-Ws 710.01 Methods. Sludge and scum from primary and secondary treatment processes shall be handled by one of the methods outlined below:

- (a) Anaerobic or aerobic digestion followed by dewatering, incineration and disposal;
- (b) Anaerobic or aerobic digestion followed by dewatering and disposal;
- (c) Raw sludge dewatering followed by incineration and disposal;
- (d) Liquid sludge incineration and disposal;
- (e) Raw sludge dewatering and disposal; or
- (f) Other processes as regulated under Env-Ws 800, entitled "Septage and Sludge Management".

Source. #6590, eff 9-26-97

Env-Ws 710.02 Anaerobic Sludge Digestion.

- (a) Multiple tanks shall be provided for the digestion process.
- (b) The proportion of depth to diameter shall be such as to allow for the formation of supernatant liquor and sludge storage.
- (c) Digestion tanks shall incorporate the following features to facilitate emptying, cleaning and maintenance:
 - (1) The tank bottom shall slope to drain toward the withdrawal pipe at a slope of not less than 3 inches per foot unless mechanical sludge collection is employed;
 - (2) Flat bottom tanks shall be prohibited;
 - (3) At least 4 access manholes shall be provided in the top of the tank in addition to the glass some with one opening;
 - (4) One of the tank access manholes shall be large enough to permit the mechanical removal of grit and sand;
 - (5) A separate side wall manhole shall be provided;
 - (6) Non-sparking tools, rubber-soled shoes, safety harness, gas detectors for inflammable and toxic

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gases, and gas masks of the hose or oxygen helmet type shall be specified for the plant; and

(7) Alarms shall be installed to warn of any drop of the liquid level below minimum operating elevation.

(d) Digestion tanks shall incorporate the following inlet and draw-off features:

(1) Multiple sludge inlets and draw-offs ports and, where used, multiple recirculation suction and discharge points, to facilitate flexible operation and effective mixing of the digester contents shall be provided unless adequate mixing facilities are provided within the digester;

(2) One inlet shall discharge above the liquid level and be located at approximately the center of the tank to assist in scum breakup; and

(3) Raw sludge inlet discharge points located so as to minimize short-circuiting;

(e) Digester tanks shall be designed to provide the capacities as follows:

(1) Where the composition of the wastewater has been established, tank capacity shall be computed from the volume and character of sludge to be digested;

(2) For conventional digestion, the volatile solids loading shall not exceed 0.03 pounds per cubic foot per day;

(3) Where composition data are not available, the unit capacities given below in Table 710-5 for conventional heated tanks shall be used for plants treating domestic wastewater:

TABLE 710-5 Unit Capacities

<u>Type of Plant</u>	<u>Minimum Cubic Feet per Capita</u>
Primary	4
Primary plus standard filter	4
Primary plus high rate filter	5
Chemical coagulation	6
Activated sludge	6

(4) The capacities shall be increased by allowing for the suspended solids of any industrial waste and garbage solids in the wastewater; and

(5) Volumes shall be calculated on the basis of the bottom sloping unless sludge moving or mixing equipment is installed.

(f) All portions of the gas system, including the space above the tank liquor, storage facilities and piping, shall be designed such that under normal operating conditions, including sludge withdrawal, the gas shall be maintained under positive pressure.

(g) All enclosed areas where gas leakage might occur shall be mechanically ventilated.

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(h) All gas metering, compressor, control and appurtenance equipment shall be located in a separate room with only an outside entrance.

(i) Pressure and vacuum relief valves and flame traps together with automatic safety shut-off valves shall be provided.

(j) Water seal equipment shall not be installed.

(k) The gas piping system shall be:

(1) Protected from freezing; and

(2) Sloped to drain to condensation traps at all low points; and

(3) Equipped with either float-controlled and U-tube water seal type condensate traps.

(l) Gas burning boilers and engines shall be:

(1) Located in ventilated rooms at ground level;

(2) Separated from the digester pipe gallery; and

(3) Equipped with flame traps.

(m) Electrical systems and equipment shall comply with the National Electrical Code requirements for class I division 2 locations.

(n) Waste gas burners shall be located at a minimum distance of 25 feet away from any plant structure.

(o) Any enclosure adjacent to digestion tanks or containing gas piping or gas equipment shall be provided with mechanical ventilation.

(p) A gas meter with by-pass shall be provided.

(q) Digestion tanks shall be insulated to minimize heat loss.

(r) Sludge shall be heated by circulating the sludge through external heaters and piping shall be designed to provide for the preheating of feed sludge before introduction to the digesters. Provisions shall be made in the layout of the piping and valving to facilitate cleaning of these lines

(s) Heat exchanger sludge piping shall be sized for heat transfer requirements.

(t) Where a digestion tank is used for heating, an auxiliary fuel shall be provided.

(u) Facilities for mixing the digester contents shall be provided where required for proper digestion by reason of loading rates or other features of the system.

(v) Tank discharge piping shall be:

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- (1) Not less than 6 inches in diameter;
 - (2) Arranged so that withdrawal can be made from 3 or more levels in the tank; and
 - (3) Equipped with an unvalved vented overflow.
- (w) High pressure backwash facilities shall be provided for draw-offs.
- (x) Provision shall be made for sampling at each supernatant draw-off level.
- (y) High pressure backwash facilities shall be provided for the piping system.

Source. #6590, eff 9-26-97

Env-Ws 710.03 Aerobic Sludge Digestion.

- (a) Aerobic sludge digestion shall be accomplished in a tank or tanks designed to provide effective air mixing, reduction of the organic matter, supernatant separation, and sludge concentration under controlled conditions.
- (b) Aerobic sludge digestion tanks shall be designed for effective mixing by aeration equipment. When air diffusers are used the system shall permit continuity of service without dewatering of tanks.
- (c) Facilities shall be provided for effective separation or decantation of the tank contents..

Source. #6590, eff 9-26-97

Env-Ws 710.04 Sludge Pumps and Piping.

- (a) Duplicate sludge delivery pumps shall be provided. Pumps shall be capable of handling raw sludge at the rates and the suction and delivery heads applicable. A minimum positive head of 24 inches shall be provided at the suction side of centrifugal type pumps. Maximum suction lift shall not exceed 10 feet for positive displacement pumps. All sludges with greater than 4 percent solid concentration shall be pumped by positive displacement type units.
- (b) Unless sludge sampling facilities are otherwise provided, quick closing sampling valves shall be installed at the sludge pumps. The size of valve and piping shall be at least 2 inches. Provisions shall be made for sampling at various levels in the mixing zone of primary digesters.
- (c) Sludge withdrawal piping shall have a minimum diameter of eight inches for gravity withdrawal and 6 inches for suction. Sludge pump discharge piping shall be at least 4 inches in diameter. Where withdrawal is by gravity, the available head on the discharge pipe shall be at least 4 feet. Provision shall be made for draining and flushing discharge lines. The length of pump suction piping for primary sludge withdrawal shall be kept to a minimum.
- (d) Gravity piping shall be laid on uniform grade and alignment. Slope on gravity discharge piping shall be not less than 3 per cent. Provision shall be made for draining and flushing sludge processing lines.
- (e) Piping installed inside digestion tanks shall have the corrosion resistance and support stability appropriate for a highly corrosive environment.

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Source. #6590, eff 9-26-97

Env-Ws 710.05 Sludge Dewatering.

- (a) Sludge drying bed area shall be sized in accordance with Table 710-6 below:

TABLE 710-6 Sludge Drying Beds (Covered)

<u>Type of Treatment</u>	<u>Minimum Area</u>
Primary	1.0 square feet per capita
Trickling Filter	1.25 "
Activated Sludge	1.5 "

(b) For percolation type drying beds, the lower course of gravel around the underdrains shall be graded and be 12 inches in depth, extending 6 inches above the top of the underdrains. A top layer of 3 inches shall consist of gravel 1/8 inch to 1/4 inch in size.

(c) The top course of the bed shall consist of 9 to 12 inches of clean sand with an effective grain size of 0.3 to 0.6 mm.

(d) Open sludge drying beds shall be prohibited.

(e) Bed underdrains shall be ductile iron, PVC or concrete pipe. Pipe shall be no less than 4 inches in diameter and spaced not more than 10 feet between centers

(f) Paved surface beds shall be prohibited.

(g) Bed walls shall be watertight and extend 15 to 18 inches above and 6 inches below the surface. Outer walls shall be curbed to prevent soil from washing on to the beds.

(h) Not fewer than 2 beds shall be provided with facility for sludge removal.

(i) Duplicate sludge dewatering units shall be provided such that dewatering can proceed with one unit out of service.

(j) Sludge storage shall precede all mechanical dewatering units. Storage may be provided by the use of holding tanks or thickeners or chemical blending tanks, as required for the total dewatering process operation.

(k) Dewatered streams shall be returned to raw or settled waste stream flow, preceding disinfection.

(l) A means shall be provided for measuring the quantity of sludge processed.

(m) Dewatering process rooms shall be lighted, heated and ventilated. Floors of process rooms shall be pitched 1/4" per foot to drain points and be slip proof.

(n) Sludge dewatering process equipment shall be housed in processing rooms.

(o) Sludge holding tanks for waste activated sludge shall be sized on the basis of 2 cubic feet per capita. Supernatant withdrawal and return to the main flow shall be provided.

Source. #6590, eff 9-26-97

PART Env-Ws 711 BIOLOGICAL TREATMENT

Env-Ws 711.01 Trickling Filters.

(a) Biological trickling filters shall only be used when the sewage is amenable to treatment by aerobic biologic processes. Trickling filters shall be preceded by effective settling tanks equipped with scum collecting devices, or other suitable pretreatment facilities and shall be followed by final settling tanks in accordance with Env-Ws 709.04.

(b) Trickling filters shall be designed either as low-rate or high rate filters which incorporate recirculation. Reduction in 5-day BOD in primary settling tanks shall be considered as not exceeding 35 percent for filter design criteria.

(c) The sewage shall be distributed over the filter by rotary distributors or other suitable devices which provide a uniform distribution to the surface area. At design average flow, the deviation from a calculated uniformly distributed volume per square foot of the filter surface shall not exceed plus or minus 10 per cent at any point. The use of mercury seals on rotary distributors shall be prohibited.

(d) Sewage shall be applied to the filters by siphons or pumps or by gravity discharge from preceding treatment units when waste flow characteristics have been developed. Application of sewage shall be continuous. Piping shall permit recirculation.

(e) A minimum clearance of 9 inches between media and distributor arms shall be provided for non-icing applications. Where icing applies the clearance shall be greater than 9 inches by an amount allowing for icing problems.

(f) The media shall be crushed rock, or other durable material and shall be durable, resistant to chipping or flaking, and be relatively insoluble in sewage. Slag media shall be free from iron, manufactured media shall be structurally stable and chemically and biologically inert. Manufactured media shall be resistant to ultraviolet degradation, disintegration, erosion, aging, common acids and alkalies, organic compounds, fungus and biological attack. Media shall be structurally capable of supporting a man's weight or access walkways shall be provided for distributor maintenance.

(g) The filter media shall have a minimum depth of 5 feet above the underdrains and shall not exceed 10 feet. There shall be no less than 3 inches freeboard.

(h) Rock, slag and similar media shall not contain more than 5 percent by weight of pieces whose longest dimension is 2 times the least dimension.

(i) Rock, slag and similar media shall be free from thin elongated and flat pieces, dust, clay, sand or fine material.

(j) Media shall conform to the following size and grading when mechanically graded over a vibrating screen with square openings:

(1) 100% by weight shall pass a 4 1/2" screen;

(2) 95-100% by weight shall pass a 3" screen;

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(3) 0-2% by weight shall pass a 2" screen; and

(4) 0-1% by weight shall pass a 1" screen.

(k) Manufactured media shall be considered only in accordance with the provisions of Env-Ws 708.05.

(l) Specification shall provide for material delivered to the filter site to be stored on wood planked or other clean hard surfaced areas and be rehandled at the filter site. No media material shall be dumped directly into the filter. The specification for installation of media shall require that crushed rock, slag and similar media shall be rescreened or forked at the filter site to remove all fines. Such materials shall be placed by hand to a depth of 12 inches above the tile underdrains and all material shall be carefully placed so as not to damage the underdrains. The remainder of the material may be placed by means of belt conveyers or equally effective methods approved by the engineer. Manufactured media shall be handled and placed as approved by the engineer. Trucks, tractors, or other heavy equipment shall not be driven over the filter during or after construction.

(m) Underdrains with semi-circular inverts or their equivalent shall be provided and the underdrain system shall cover the entire floor of the filter. Inlet openings into the underdrains shall have an unsubmerged gross combined area equal to at least 15 per cent of the surface area of the filter.

(n) The underdrains shall have a minimum slope of one per cent. Effluent channels shall be designed to produce a minimum of velocity of 2 feet per second at average daily rate of application to the filter. Provision shall be made for flushing the underdrains. In small filters, use of a peripheral head channel with vertical vents shall be acceptable for flushing purposes. Inspection facilities shall be provided.

(o) The underdrain system, effluent channels, and effluent pipe shall be designed to permit free passage of air. The size of drains, channels, and pipe shall be such that not more than 50 per cent of their cross-sectional area shall be submerged under the design hydraulic loading.

(p) Filter structures shall be designed to:

(1) Allow maintenance, flushing and draining;

(2) Permit measurement of filter influent flow and recirculation flow; and

(3) Provide protection from potential damage due to ice formation.

(q) Trickling filters shall be designed for loadings not to exceed the values given in Table 711-7 below:

TABLE 711-7 Trickling Filter Loading

Hydraulic Loading (gpd/sf)	5-day BOD (ppd/1000 cu. ft. media)
For low rate type, 70	15
For high rate type, 275-700	45

(r) Recirculation facilities including process controls shall be designed to maintain the desired efficiency and remain within the hydraulic range shown in Table 711-7 above. Performance of filters packed with manufactured media shall be determined from pilot plant and full scale experience.

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(s) Means shall be provided for recirculating a portion of the final settling tank effluent during periods of low flow.

(t) The number and capacities of the recirculation pumps shall be such that a minimum rate of application of 230 gallons per square foot per day can be maintained with the largest pump out of service, unless other provision is made which shall permit an effective degree of treatment if pump failure occurs. Piping shall permit bypassing of filter for power failure conditions when emergency power sizing will not permit running of pumps.

Source. #6590, eff 9-26-97

Env-Ws 711.02 Activated Sludge.

(a) The activated sludge process and its various modifications shall be used only where sewage is amenable to biological treatment. Plans for plants contemplating abnormally strong concentrations of sewage, an unusual aeration period, or special equipment or arrangements, shall be submitted with supporting data obtained for existing installations demonstrating the efficacy of the process. All designs shall provide for flexibility in operation.

(b) Primary settling shall be incorporated in the process for all but the extended aeration and contact stabilization modifications. Surface settling rate shall be no greater than 1,000 gpd/sf, and the detention period shall be not less than one hour at design average flow. A by-pass shall be provided so that raw waste may flow directly to the aeration process following pretreatment.

(c) Where primary settling tanks are not used, effective removal of grit, debris, excessive oil or grease, and comminution of solids shall be provided prior to the activated sludge process.

(d) In the absence of primary settling tanks, an alternative means of waste sludge concentration or disposal shall be provided.

(e) Final settling tank inlets and sludge collection and withdrawal facilities shall be designed so as to minimize density currents and to assure rapid return of sludge to the aeration tanks.

(f) Multiple units capable of independent operation shall be provided in all plants.

(g) Surface settling rates and detention times shall be in accordance with Table 711-8 below:

TABLE 711-8 Surface Settling Rates

<u>Type of Process</u>	<u>Flow (mgd)</u>	<u>Time (Hours)</u>	<u>Nominal Final Surface Settling Rates (gpd/sf)</u>	<u>Peak Surface Settling Rate (gpd/sf)</u>
Conventional, Modified or "High Rate" & Step Aeration	< 0.5	3.0	700	1400
	0.5 to 1.5	2.5	700	1400
	>1.5	2.0	800	1400
Contact	< 0.05	3.6	500	1400
Stabilization	0.5 to 1.5	3.0	600	1400

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	> 1.5	2.5	700	1400
Extended	< 0.05	4.0	300	
Aeration	0.05 to 0.15	3.6	500	
	> 0.15	3.0	500	

(h) The engineer shall furnish aeration tank sizing calculations to the department.

(i) Aeration tank capacities and loadings for various modifications of the process shall be as shown in Table 711-9 below:

TABLE 711-9 Aeration Tank Retention

Process Type	Plant Flow mgd	Aeration Retention Period (Hours)	Organic Loading #BOD/1000 ft ³	F/M Ratio BOD:MLSS
Conventional	< 0.5	7.5	30	.25 to .50
	0.5 to 1.5	7.5 to 6.0	30 to 35	.25 to .50
	> 1.5	6.0	35	.25 to .50
Step Aeration	< 0.5	7.5 to 5.0		.30 to .50
	> 1.5	5.0	50	.20 to .50
Contact Stabilization	< 0.5	3.0	30	.05 to .10
Extended Aeration	All	20 to 24	12.5 to 17	.05 to .10

(j) Multiple aeration tanks capable of independent operation shall be provided. The dimensions of each mixed liquor aeration tank or return sludge reaeration tank shall be such as to maintain effective mixing and utilization of air. Liquid depths shall be not less than 10 feet nor more than 15 feet.

(k) Inlets and outlets for each aeration tank unit shall be equipped with valves, gates, stop plates, weirs, or other devices to permit flow control to any unit and to maintain a constant liquid level. The hydraulic properties of the system shall permit the maximum instantaneous hydraulic load to be carried with any single aeration tank unit out of service.

(l) Channels and pipes carrying liquids with solids in suspension shall be designed to maintain self-cleansing velocities or shall be agitated to keep such solids in suspension at all rates of flow within the design limits. Piping shall permit flexible operation sequence of tanks and returned sludge inlets.

(m) Devices shall be installed for indicating and recording flow rates of raw sewage or primary effluent, return sludge, and air to each tank. For plants designed for sewage flows of 0.5 mgd or more, these devices shall totalize and record, as well as indicate, flows. Where the design provides for all return sludge to be mixed with the raw sewage or primary effluent at one location, then the mixed liquor flow rate to each aeration unit shall be controlled.

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(n) All aeration tanks shall have a freeboard of not less than 18 inches.

(o) Froth and foam control shall be provided at the aeration tanks.

(p) All aeration equipment shall be capable of maintaining a minimum of 2.0 mg/l of dissolved oxygen in the mixed liquor at all times, providing thorough mixing of the mixed liquor, and preventing deposition of solids at any point in the tanks. Electrical controls shall be protected from the elements.

(q) Air requirements for diffused air systems shall be shown in Table 711-10 below.

TABLE 711-10 Air Requirements

<u>Process</u>	<u>Air (ft³ / lb BOD tank load)</u>
Conventional	1200 - 1500
Step Aeration	1200 - 1500
Contact Stabilization	1200 - 1500
Modified or "High Rate"	400 - 1500
Extended Aeration	1500 - 2000

(r) Blowers for diffused air systems shall be provided in multiple units, so arranged and in such capacities as to meet the maximum air demand with the single largest unit out of service. This capacity shall be at least 1.5 cubic feet per gallon of incoming waste plus the reaeration needs. The design shall also provide for varying the volume of air delivered in proportion to the load demand of the plant.

(s) Blowers shall be located in a room which is separated from the office, laboratory, or control room by insulated walls to minimize the noise. The noise level shall not exceed 90 decibels in the blower room nor exceed 50 decibels in the office, laboratory, or control room. Mechanical ventilation of the blower room shall be provided.

(t) The air diffusion piping and diffuser system shall be capable of delivering 200 per cent of the normal air requirements. Diffusers shall be spaced to satisfy oxygenation requirements through the length of the channel or tank, and shall be designed to facilitate spacing adjustments using existing air header piping. The arrangement of diffusers shall also permit their removal for inspection, maintenance and replacement without dewatering the tank and without shutting off the air supply to other diffusers in the tank.

(u) Individual diffuser assembly units shall be equipped with control valves with indicator markings for throttling and shut off. Diffusers within any single assembly shall have uniform pressure loss. Air flow measurements shall be provided.

(v) Air intake and discharge system shall include:

- (1) Air filters in numbers, arrangement, and capacities to furnish at all times an air supply having a dust content of not more than 0.5 mg/1000 cubic feet;
- (2) Pressure drop alarms to prevent blower overheating; and
- (3) Intake and discharge silencers to minimize nuisance noise from blowers.

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(w) Single or multiple mechanical aeration units may be used to satisfy the air requirements. One spare motor shall be furnished for each aeration tank assembly. A system shall be provided so that each unit can be removed and replaced.

(x) The mechanical aerator drive mechanism shall be protected from ice formation and damage.

(y) Multiple mechanical aeration unit installations shall be so designed as to meet the maximum air demand with the largest unit out of service. The design shall also provide for varying the amount of oxygen transferred in proportion to the load demand on the plant.

(z) The minimum permissible return sludge rate of withdrawal from the final settling tank shall be a function of the mixed liquor suspended solids concentration entering the tank, the sludge volume index of these solids, and the detention time of these solids in the settling tanks.

(aa) The return sludge rate shall be varied by means of variable speed motors, drives, or timers. The return sludge rate, expressed as a percentage of design average sewage flow, shall be variable within the limits set forth in Table 711-11 below.

TABLE 711-11 Return Sludge Rates (%)

	<u>Minimum</u>	<u>Normal</u>	<u>Maximum</u>
Conventional	15	30	75
Modified or "High Rate"	10	20	50
Step aeration	20	50	75
Contact stabilization	50	100	150
Extended aeration	50	100	200

(ab) Return activated sludge pumps shall have variable combined capacity, capable of pumping at least 25 per cent of the design flow with the largest single unit out of service. Return sludge pump capacity shall range from 10 per cent to 100 per cent of the average dry-weather sewage flow.

(ac) In addition to capacity required for return sludge pumping, waste sludge pumping facilities shall be provided with a minimum capacity not less than 25 per cent of design average flow, or ten gallons per minute, whichever is larger. Waste sludge pumps shall function satisfactorily at 0.5 percent of design flow.

(ad) Waste activated sludge may be discharged to the primary settling tanks, concentration tanks or digestion tanks.

(ae) The use of air lift units for sludge handling shall be approved only for plants with design average flows less than 70,000 gpd.

(af) Suction and discharge piping shall be at least 4 inches in diameter and be designed to maintain a velocity of not less than 2 feet per second when return sludge facilities are operating at normal return sludge rates. A method for observing, sampling and controlling return activated sludge flow from each settling tank shall be provided.

Source. #6590, eff 9-26-97

Env-Ws 711.03 Oxidation Ditches.

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- (a) Oxidation ditches shall be considered a modification of the extended aeration process.
- (b) Oxidation ditch designs shall comply with the following requirements:
 - (1) Ditches shall be provided in duplicate, each capable of handling 65 percent of the design average flow;
 - (2) Ditches shall be interconnected such that either ditch can be taken out of service temporarily;
 - (3) Channel cross-section shall be trapezoidal in shape;
 - (4) Liquid depth between 3 and 5 feet;
 - (5) Velocity not less than one foot per second;
 - (6) Ditches shall be lined with concrete or asphalt;
 - (7) The rotor shall provide not less than 2 pounds of oxygen per pound of 5-day BOD at design load;
 - (8) Rotor submergence shall be adjustable by means of adjustable aluminum or fiberglass outlet weirs;
 - (9) The use of shims to adjust the rotor submergence shall be prohibited;
 - (10) The motor drive shall be weatherproof ;
 - (11) The motor drive shall be controlled by time clock ;
 - (12) The motor drive bearings shall be accessible for lubrication;
 - (13) The motor drive bearing housing shall be protected from wastewater penetration; and
 - (14) The rotor and bridge shall be protected from winter ice build-up which would result in damage to the rotor system.

Source. #6590, eff 9-26-97

Env-Ws 711.04 Rotating Biological Contactors (RBC).

- (a) RBC units shall be housed or otherwise protected from winter conditions and freezing damage.
- (b) Primary wastewater settling tanks shall precede RBC treatment units.
- (c) Multiple trains shall be furnished for flexible operation and stage bypassing.
- (d) Flow control to RBC tanks shall be by splitter boxes and weirs, and flow measurement shall be provided to determine the flow split.
- (e) Buildings housing RBC processes shall have ventilation of at least 6 air changes per hour.

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(f) Electrical system components, panels, light fixtures, motors, and control centers shall be watertight and corrosion resistant.

(g) Shafts and media shall be designed for an operational life of 20 years.

(h) Where total weight build-up is critical, weight measurement shall be furnished.

Source. #6590, eff 9-26-97

PART Env-Ws 712 STABILIZATION PONDS

Env-Ws 712.01 Limitation. Use of stabilization ponds shall be limited to communities with a service population of 1000 persons or fewer.

Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 712.02 Design Requirements.

(a) Organic loading rates shall fall in the range 15 - 35 pounds of BOD per acre per day.

(b) A minimum of 3 lagoon cells shall be provided and interconnected to enable the following:

(1) Both series and parallel operation modes; and

(2) Isolation of any cell while maintaining the hydraulic control capacity of the interconnection piping and structures.

(c) Comminution or screening devices and grit removal facilities shall precede discharge into a lagoon.

Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 712.03 Groundwater Pollution and Soil Formation.

(a) Contamination of groundwater by transmission through the soil which can cause a health hazard in water supplies or cause receiving water problems shall be prohibited.

(b) Liquid loss through the lagoon dikes and bottom shall be prohibited.

(c) Plastic membrane liners shall be installed in all new lagoons.

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Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 712.04 Transmission Through The Lagoon Bottom. Wastewater transmission through lagoon bottoms shall meet groundwater or surface water limitations of the groundwater permit.

Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 712.05 Lagoon Embankments, Dikes & Bottom.

(a) Lagoon dikes, embankments, and bottoms shall form a stable structure impervious to seepage of lagoon liquid.

(b) The minimum top width of a dike or embankment shall be 8 feet to permit access by maintenance vehicles.

(c) Lagoon dikes and embankments shall have inner faces not steeper than a 3:1 slope nor shallower than a 4:1 slope, and outer faces not steeper than a 3:1 slope.

(d) Lagoons shall be designed such that surface water shall not flow or drain into the lagoons.

(e) Lagoon dikes shall be designed to provide a minimum of 3 feet of freeboard above normal lagoon water surface elevation.

(f) The maximum and minimum normal operating depths shall be 5 feet and 3 feet, respectively.

(g) Seeding and erosion control shall be as follows:

(1) Outside slopes shall be seeded; and

(2) Inside slopes shall have rip rap of suitable size and weight installed to at least one foot below normal lagoon level.

(h) The lagoon bottom shall be smooth and level at all points. Finished elevations shall vary not more than 3 inches from the average elevation of the bottom.

Source. #6590, eff 9-26-97

Env-Ws 712.06 Distribution and Interconnection Piping.

(a) Self-cleaning velocities shall be present in distribution piping, and piping cleanouts shall be provided.

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(b) To prevent erosion due to discharge at the termination of distribution piping, the piping shall rest on a concrete apron 4 feet square, as a minimum.

(c) Interconnecting piping shall discharge horizontally near to the lagoon bottom and at the dike, thereby reducing erosion effects.

(d) Piping shall be ductile iron or equivalent rated material.

(e) Distribution and interconnection piping clean-outs shall be provided.

Source. #6590, eff 9-26-97

Env-Ws 712.07 Overflow Structures.

(a) Each overflow structure shall be equipped with adjustable devices to permit operation at depths of 3 to 6 feet.

(b) Weirs or gates shall be of lightweight, corrosion-resistant material such as aluminum or fiberglass.

(c) Scum baffle mechanisms shall be provided.

(d) Provision shall be made for draining the lagoons.

(e) Location of draw off pipes shall minimize erosion effects.

Source. #6590, eff 9-26-97

Env-Ws 712.08 Area Control.

(a) Fencing shall surround the entire site with locking access gates for vehicles and equipment.

(b) Warning signs shall be provided along the fence advising against trespassing and showing the nature of the facility.

Source. #6590, eff 9-26-97

Env-Ws 712.09 Flow Measurement. Means for indicating, recording and totalizing flow shall be provided at the inlet and outlet of the plant.

Source. #6590, eff 9-26-97

Env-Ws 712.10 Operations Building. An operations building shall be provided with the following:

(a) Office area;

(b) Equipped laboratory;

(c) Toilet and shower;

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- (d) Shop and yard maintenance equipment storage area; and
- (e) Chemical and equipment storage.

Source. #6590, eff 9-26-97

PART Env-Ws 713 AERATED LAGOONS

Env-Ws 713.01 Treatment Requirement. Aerated lagoons shall be designed to achieve a minimum of 85% removal of 5-day BOD under winter conditions and 90% removal under summer conditions.

Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 713.02 Design Requirements.

- (a) Surface loading shall not exceed 150 pounds of 5-day BOD per acre per day for a depth of 10 feet.
- (b) Volumetric loading shall not exceed 0.75 pounds of 5-day BOD per 1000 cubic feet.
- (c) There shall be a minimum of 2 separate cells.
- (d) Piping to the cells shall be so arranged that the cells may be operated in series or in parallel.
- (e) Aerated lagoons shall be preceded by comminuting or screening devices and by grit removal facilities.
- (f) The lagoons shall be rectangular in shape.

Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 713.03 Aeration Equipment.

- (a) Aeration shall be of the diffused or mechanical mixing type.
- (b) Aeration capacity shall be sufficient to maintain a minimum of 2 mg/l of dissolved oxygen residual under all loading conditions.
- (c) Multiple blower units shall be provided and sized such that, with any unit out of service, the remaining units are capable of supplying all aeration needs.

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(d) Means shall be provided for regulating, measuring, and recording the flow of air to the lagoons.

Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 713.04 Aerated Lagoon Design Details.

(a) Design shall be in accordance with the provisions of Env-Ws 712, except that the minimum depth of the lagoons shall be 10 feet and the maximum depth shall be 15 feet.

(b) Air diffusion piping headers and piping supports shall be corrosion-resistant with a durability for the anticipated life of the plant.

(c) Ductile iron pipe headers or piping shall not be cement lined.

(d) Gas cleaning systems shall include a means for eliminating any water in the diffuser piping and headers, so as to prevent acid formation and corrosive attack on metallic piping surfaces or welds.

(e) Lagoon systems shall be designed to avoid areas of wastewater stagnation, solids deposition or dead zones.

Source. #6590, eff 9-26-97

PART Env-Ws 714 DISINFECTION

Env-Ws 714.01 Disinfection Requirement. All wastewater shall be disinfected prior to discharge to effect compliance with bacteria limitations of the discharge permit.

Source. #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 714.02 Methods. The following disinfectant methods shall be allowed for wastewater discharges:

(a) Sodium or calcium hypochlorite; or

(b) Ultraviolet irradiation.

Source. #6590, eff 9-26-97

Env-Ws 714.03 Hypochlorite Systems.

(a) Hypochlorite solution feed equipment shall incorporate effluent flow proportional or demand proportional

control systems.

- (b) Hypochlorite feeders shall be of the positive displacement type.
- (c) Hypochlorite solution storage shall be of sufficient volume to provide for dosing at 15 parts per million at design average flow for 7 days.
- (d) Hypochlorite solution feed units shall be capable of dosing to 10 parts per million at peak flows, with turndown capabilities to accommodate minimum flows.
- (e) Hypochlorite equipment and appurtenances shall be provided in duplicate.
- (f) Solution day tanks shall provide a minimum of 36 hours storage.
- (g) A supply of dilution water shall be available for preparing the required feed solution strengths and rates.
- (h) The dilution water shall be obtained from the plant water supply or plant effluent.
- (i) Rooms housing hypochlorite feed equipment and appurtenances shall be mechanically ventilated to provide at least one air change every 10 minutes.
- (j) Application of hypochlorite shall be as follows:
 - (1) Thorough mixing of the disinfectant at the day tanks and at the point of injection before the contact tank shall be provided; and
 - (2) A minimum contact period of 15 minutes at peak hourly flow or maximum rate of pumping shall be provided.
- (k) Contact tank design shall be as follows:
 - (1) The contact tank shall be constructed so as to reduce short circuiting of flows;
 - (2) A 40:1 length to width ratio of the contact passage shall be provided;
 - (3) A scum baffle and scum removal piping shall be provided; and
 - (4) Provisions shall be made for draining and removing the contents of the contact tank.
 - (5) Drainage flow shall be returned to the treatment process.
- (l) Facilities shall be provided for securing samples, either grab or continuous as stipulated by permit, of the disinfected effluent after contact.
- (m) Equipment for residual chlorine testing or control shall be provided, which equipment shall be capable of measuring in the range of 10 parts per million to the lower limit established by permit.
- (n) An alarm system shall be provided to actuate upon failure of hypochlorite feed system.

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Source. #6590, eff 9-26-97

Env-Ws 714.04 Dechlorination Systems.

(a) Dechlorination to reduce free and combined chlorine residuals in plant effluent shall be by use of sulfite salt solutions.

(b) Dechlorination systems shall be sized to:

- (1) Chemically neutralize 5 parts per million total residual chlorine at all flows;
- (2) Provide thorough mixing at the point of sulfite injection; and
- (3) Provide a contact time of 10 seconds at design average flow after mixing.

Source. #6590, eff 9-26-97

Env-Ws 714.05 Ultraviolet (UV) Irradiation Systems.

(a) Ultraviolet disinfection systems shall deliver ultraviolet radiation at such controlled dosages and wavelengths as to effect compliance with the bacteriological limits of the discharge permit.

(b) The ultraviolet disinfection system shall consist of multiple banks of lamp modules capable of disinfecting peak flows when operated in tandem, and design average flows with any bank out of service.

(c) Provisions shall be made for easy removal and inspection of UV lamps for maintenance or replacement without draining the UV channel.

(d) Provisions shall be made for draining the UV channel.

(e) UV system controls shall enable lamps to be energized and de-energized in proportion to the effluent flow. Warning alarms and automatic shut down shall be provided. Lamp output through the contact area shall be monitored, and a low dosage warning signal shall be furnished.

(f) The UV system shall be connected to the plant's standby power source.

(g) The UV system shall not produce any dangerous levels of ozone.

(h) The UV system operating area shall be ventilated.

(i) The UV system shall be housed for year round operation.

Source. #6590, eff 9-26-97

PART Env-Ws 715 OWNERSHIP OF WASTEWATER TREATMENT FACILITIES

Env-Ws 715.01 Purpose. The purpose of this part is to establish conditions for issuance of discharge permits to privately owned, non-industrial wastewater treatment facilities under the authority of RSA 485-A:13.

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Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 715.02 Definitions.

(a) "Wastewater treatment facility" means an arrangement of devices and structures for treating wastewater and for the dewatering and handling of sludge removed from such wastewater. Such facilities do not include conventional septic tanks and leach field systems as regulated under RSA 485-A:29.

(b) "Municipality" means a city, town, district, county or other public body created under state law having jurisdiction over treatment and disposal of wastewater.

(c) "Privately owned" means ownership by an entity other than a municipality.

(d) "Local legislative body" means one of the basic forms of municipal government as defined in RSA 672:8.

(e) "Discharge permit" means a national pollutant discharge elimination system (NPDES) permit or a New Hampshire groundwater permit.

Source. #757, eff 2-18-76; ss by #2245, eff 12-31-82; ss by #2670, eff 4-12-84; ss by #4860, eff 7-5-90; EXPIRED 7-5-96

New. #6350, INTERIM, eff 10-5-96, EXPIRED 2-2-97

New. #6590, eff 9-26-97

Env-Ws 715.03 Subsurface Disposal Options. No discharge permits for wastewater treatment facilities discharging to surface waters or groundwaters shall be issued unless all subsurface disposal options have been considered and rejected by the department.

Source. #6590, eff 9-26-97

Env-Ws 715.04 Ownership Requirements. No discharge permits for wastewater treatment facilities discharging to surface waters or groundwaters shall be issued unless the facility is:

(a) Municipally owned and operated;

(b) Municipally owned with a private contract for operations and maintenance;

(c) Privately owned where connection to a municipal system is not possible, provided that:

(1) The municipality in which the facility is proposed agrees by affirmative vote of the local legislative body to be the holder or co-holder of any discharge permits issued; and

(2) The documentation requirements of Env-Ws 715.06 are met;

(d) Privately owned where municipal ownership is not possible, connection to municipal system is not possible, and the municipality in which the facility is located refuses to hold or co-hold the discharge permit, and provided that the documentation requirements of Env-Ws 715.06 are met. A negative vote of the local legislative body shall be the only acceptable proof of refusal by a municipality to own the facility or hold or co-hold the discharge permit.

Source. #6590, eff 9-26-97

Env-Ws 715.05 Capacity.

(a) Private ownership as allowed under Env-Ws 715.04(c) and (d) shall be limited to wastewater treatment facilities with design flow capacities of 50,000 gpd or greater.

(b) Wastewater treatment facilities constructed to replace or rehabilitate an existing failed subsurface disposal system shall not be subject to the size restriction of (a) above, but shall otherwise meet the requirements of Env-Ws 715.

Source. #6590, eff 9-26-97

Env-Ws 715.06 Technical Documentation Requirements. An applicant for a discharge permit for a privately owned wastewater treatment facility as specified in Env-Ws 715.04(c) or (d) shall submit the following technical documentation:

(a) Engineering and water quality studies as required to demonstrate that the proposed facility is consistent with statewide, areawide, or regional water quality planning pursuant to sections 205(j)(1), 205(j)(5) or 208 of the federal Water Pollution Control Act of 1972, as amended;

(b) Engineering and water quality studies to demonstrate that the discharge is consistent with the water quality goals as provided in RSA 485-A:8 and Env-Ws 432, water quality standards;

(c) Evidence in the form of certification from the municipality that the system proposed has the concurrence of the local governing body and local land use boards as defined in RSA 672;

(d) Technical design drawings and specifications in accordance with Env-Ws 700, standards of design and construction for sewerage and wastewater treatment facilities;

(e) Certification by a New Hampshire-licensed professional engineer that the facilities have been built in accordance with the approved plans and specifications, which certification shall be submitted within 60 days following completion of construction of the facility;

(f) Evidence in the form of an agreement that the wastewater treatment facility will be operated by a certified operator as defined in Env-Ws 901;

(g) An operations and maintenance manual providing information and guidance for day-to-day operation of the treatment facilities, which manual shall be submitted within 60 days following completion of construction of the facility; and

(h) The operations and maintenance manual cited in (g) above shall include the following:

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- (1) Information on process design assumptions;
- (2) Unit process information that includes control measures and monitoring procedures for the various processes;
- (3) Start-up procedures for each unit operation and piece of equipment;
- (4) Maintenance management systems;
- (5) Laboratory test procedures;
- (6) Safety procedures;
- (7) Organizational structure and administrative procedures;
- (8) Troubleshooting procedures; and
- (9) Emergency operation plan;

Source. #6590, eff 9-26-97

Env-Ws 715.07 Financial Documentation Requirements. An applicant for a discharge permit for a privately owned wastewater treatment facility as specified in Env-Ws 715.04(c) or (d) shall submit the following financial documentation:

- (a) A system for assessing the users of the wastewater treatment facility, which system shall:
 - (1) Assess users on a pro rata basis;
 - (2) Generate sufficient funds to be used to cover all expenses and charges related to the operation, maintenance, routine repair and replacement, and financing of the wastewater treatment facilities;
 - (3) Include provisions for calculating the assessments based on the total costs enumerated in (2) above; and
 - (4) Include provisions for notifying users of the amounts due, collecting the amounts due on a periodic basis, and rebating excess collections or applying excess collections to the next billing period. Such system may also include provisions for terminating service or assessing and collecting penalties for non-payment;
- (b) Evidence of a capital reserve account, which account shall:
 - (1) Be sufficient to cover the cost of replacement of the wastewater treatment facility within 20 years;
 - (2) Serve as a source of funds for emergency cleanup and containment and major repairs or replacement of system components;
 - (3) Be established prior to initiation of operation of the wastewater treatment facility;

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- (4) Identify the situations in which the account may be accessed;
 - (5) Restrict account payments for repair and replacement costs to those in excess of \$2,000;
 - (6) Be sheltered from liability or bankruptcy claims, attachments or other such liens;
 - (7) Provide for management of the account and bonding of the account managers;
 - (8) Authorize access to the account by the department for use in remedying an emergency situation in cases where the managers of the account refuse to remedy the emergency situation; and
 - (9) Provide for funding the account;
- (c) Ownership documentation, comprising:
- (1) Documents which evidence the owner's legal authority to construct and provide continuous operations and maintenance of the facilities. Such documents shall include, but shall not be limited to, one of the following:
 - a. The articles of incorporation for a private corporation;
 - b. The partnership agreement for a partnership; or
 - c. The condominium instruments for a condominium association;
 - (2) For issuance of a permit pursuant to Env-Ws 715.04(c), a formal written and executed agreement between the owner and the municipality that the municipality has agreed to be the holder or co-holder of the discharge permit; and
 - (3) For issuance of a permit pursuant to Env-Ws 715.04(d), a docket number from the New Hampshire public utilities commission showing that the facility owner is or will be a company subject to, and in full compliance with, the rules of the New Hampshire public utilities commission.

Source. #6590, eff 9-26-97